

DIESEL PROGRESS



JANUARY, 1945

FIVE DOLLARS PER YEAR—FIFTY CENTS PER COPY

**THE TREND'S DEFINITELY
DEFS TO DIESELS**



SINCE 1940, the use of Diesel electric locomotives on major U. S. railroads has increased more than 350 per cent. Typical of the powerful Diesel locomotives now in service is Western Pacific's "901", consisting of four sections, each with a 16-cylinder, 2-cycle engine capable of developing 1350 hp. at 800 rpm.

Use of Diesels in stationary installations is also increasing. But wherever Diesels are used—in stationary plants or mobile equipment—on land or sea—they operate more efficiently when lubricated with Texaco.

Texaco Ursa Diesel lubricants constitute a complete line of oils. There is one to meet the lubri-

tion requirements of every type of Diesel engine. They increase the life of rings, pistons, liners and bearings by overcoming scuffing, ring-sticking, sludge and corrosion. Because of these benefits—

More stationary Diesel hp. in the U. S. is lubricated with Texaco than with any other brand.

A Texaco Lubrication Engineer, specializing in Diesel lubrication, will gladly recommend the most suitable type and grade of *Texaco Ursa Oil* for your engine. Phone the nearest of more than 2300 Texaco distributing points in the 48 States or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TEXACO Lubricants and Fuels FOR ALL DIESEL ENGINES

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS ★ METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

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COVER ILLUSTRATION: The Tuna Clipper "Americano" - fish capacity 145 tons, powered with a Detroit Diesel 400 hp. main Diesel and two Caterpillar 110 hp. auxiliary Diesels.

BACK COVER ILLUSTRATION: Logging with Allis-Chalmers Heavy-duty tractor using a Detroit Diesel by Detroit Diesel Division.

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A 13 WORD RECOMMENDATION for BRIGGS OIL CLARIFIERS



Engine room of tug "Marion" showing Briggs Model D-6-AA-X tube Oil Clarifier. The sister ship of this tug—the "Jane"—is similarly equipped and is showing the same remarkable operating efficiency.

That is the statement made by R. J. Ponds, Marine Superintendent of the Curtis Bay Towing Company . . . operators of the Great Silver Fleet of tugs that serve busy Baltimore harbor.

Briggs Oil Clarifiers have shown this company that they help add DEPENDABILITY to a company's service to its customers. And—

while providing this valuable service . . . they effect savings in operating and maintenance costs . . . save engines.

The Briggs distributor in your locality will tell you WHY AND HOW Briggs Oil Clarifiers will benefit you. Call him—or write manufacturer for literature.

OPERATING DATA ON TUG "MARION"	
ENGINE	Enterprise Diesel, 300 HP at 300 RPM
LUBE OIL	Straight mineral
OPERATION	120 hours per week
LOAD	50%
OIL CONSUMPTION	1/2 gallon a day
OIL CHANGED	1600 hours
CLARIFIER REFILLS CHANGED	1600 hours

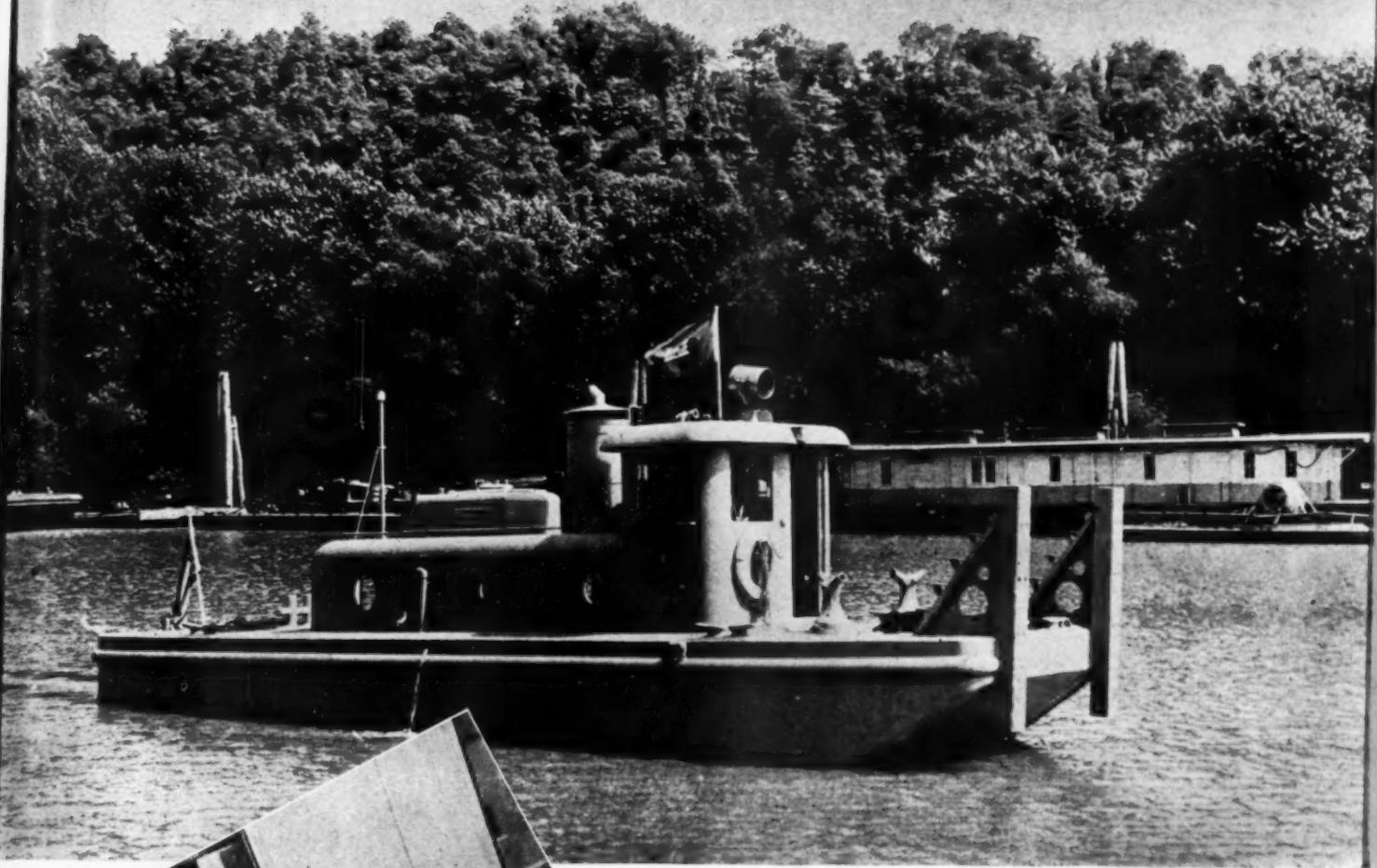
Briggs

PIONEERS IN MODERN
OIL FILTRATION



BRIGGS CLARIFIER COMPANY General Offices—Washington 7, D. C.

DISTRIBUTORS IN PRINCIPAL CITIES . . . CONSULT THE YELLOW PAGES OF YOUR TELEPHONE DIRECTORY.



Compact and clean-lined, this 42 ft. U. S. Engineer Dredge Tender is powered with a Gray Marine Diesel.

IT'S A DREDGE TENDER

Below: View of the 165 hp. Gray Marine main engine.



UNIQUE in appearance and typically U. S. Engineering design is the Diesel dredge tender recently completed at the U. S. Boatyard, Gasconade, Missouri—the first of seven of this type.

These remarkable little craft are only 42 ft. x 11 ft. x 5 ft.-7½ in.—obviously of the river type with familiar towing knees which are in fact, pushers. Of very shallow draft and all-steel construction they give the impression of concentrated efficiency. Some idea of their "pushing," (on the rivers they still call it "towing") ability, is given in a recent job of propelling a barge, 87 ft. x 28 ft. x 7 ft. loaded with 67,000 gal. of oil (365 tons) at 1.65 mph. upstream, while in still water the same load was moved at 4.49 mph. with her Diesel turning 1650 rpm. Running light the dredge tender moves at the amazing clip of 9.4 mph. at 1900 rpm., the propulsion unit being a Gray Marine Diesel of 165 hp. with a 2:1 reduction gear.

DIESELS CONTRIBUTE TO DAIRY SUCCESS

By T. J. MALONE

BUTTER goes with bread, cream with coffee, ice cream with applepie—why shouldn't running a creamery in a new dairy country be a good business, with a future? Conrad Gerland thought it should be when forty years ago, on April 1, last, he took over a small creamery in Rice Lake, Wisconsin, and began operating it as a one-man concern. He made a go of it. He built a business out of it, an outstanding example of the opportunity that America offers and of the possibility in free enterprise to a man of earnest purpose, capacity and vision.

In four decades of ownership and management by the Gerland family, the Rice Lake Creamery Co. has grown in this way: from one man to more than eighty employees; from one team of mules to more than forty trucks; from a crude wooden building with modest equipment handling a few thousand pounds of milk a day to a substantial two-story brick structure with the latest machinery handling nearly half a million pounds daily; from seventy-five farmer patrons to about one thousand; from supplying only a local market to shipping its various products throughout the world. One half of the output these days goes to the armed services.

Through the years, the plant, at first making butter only, added other products—Gerland's sweet cream, ice cream, frozen cream, dry milk solids (powdered milk), sweetened condensed skim milk and sweetened condensed whole milk. In the paralleling expansion of its mechanical equipment, a notable step was the installing in 1938 of Diesel engines and electric generators, replacing transmission-line service.

Two Fairbanks, Morse & Co. 90 hp. Diesels were installed with standard auxiliary equipment. Increasing production in the plant called for more power by 1942, when a 150 hp. F-M Diesel with generator, was added.

The period of Diesel operation has seen two major improvements in the plant, along with power savings offsetting the cost of engines and auxiliaries. Stainless steel condensing equip-

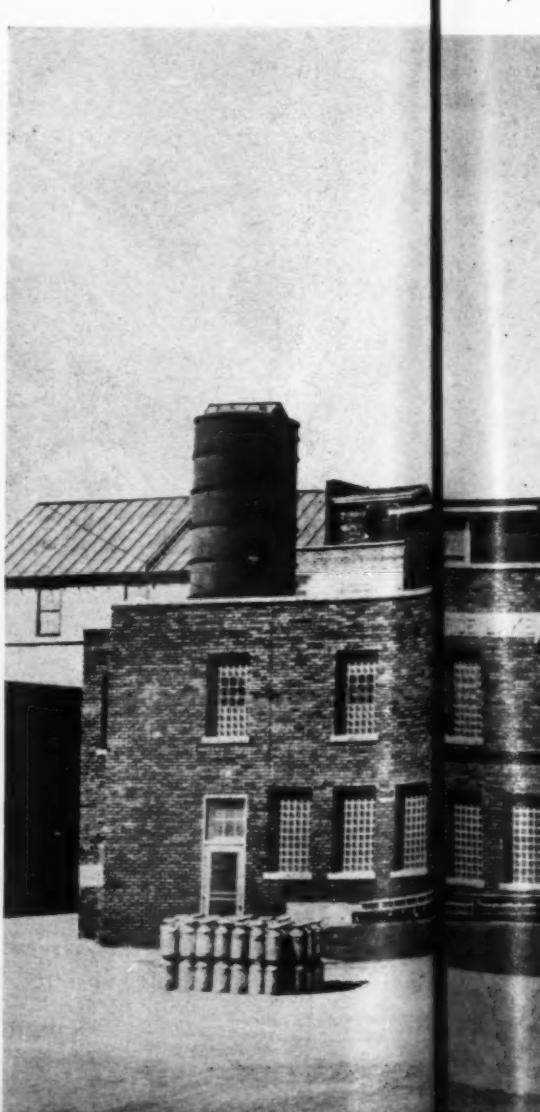
ment was installed in 1938, replacing copper, and two years later new drying equipment was added to make powder for human consumption. According to Harry Gerland, Vice President of the company, the change to Diesels was a happy one.

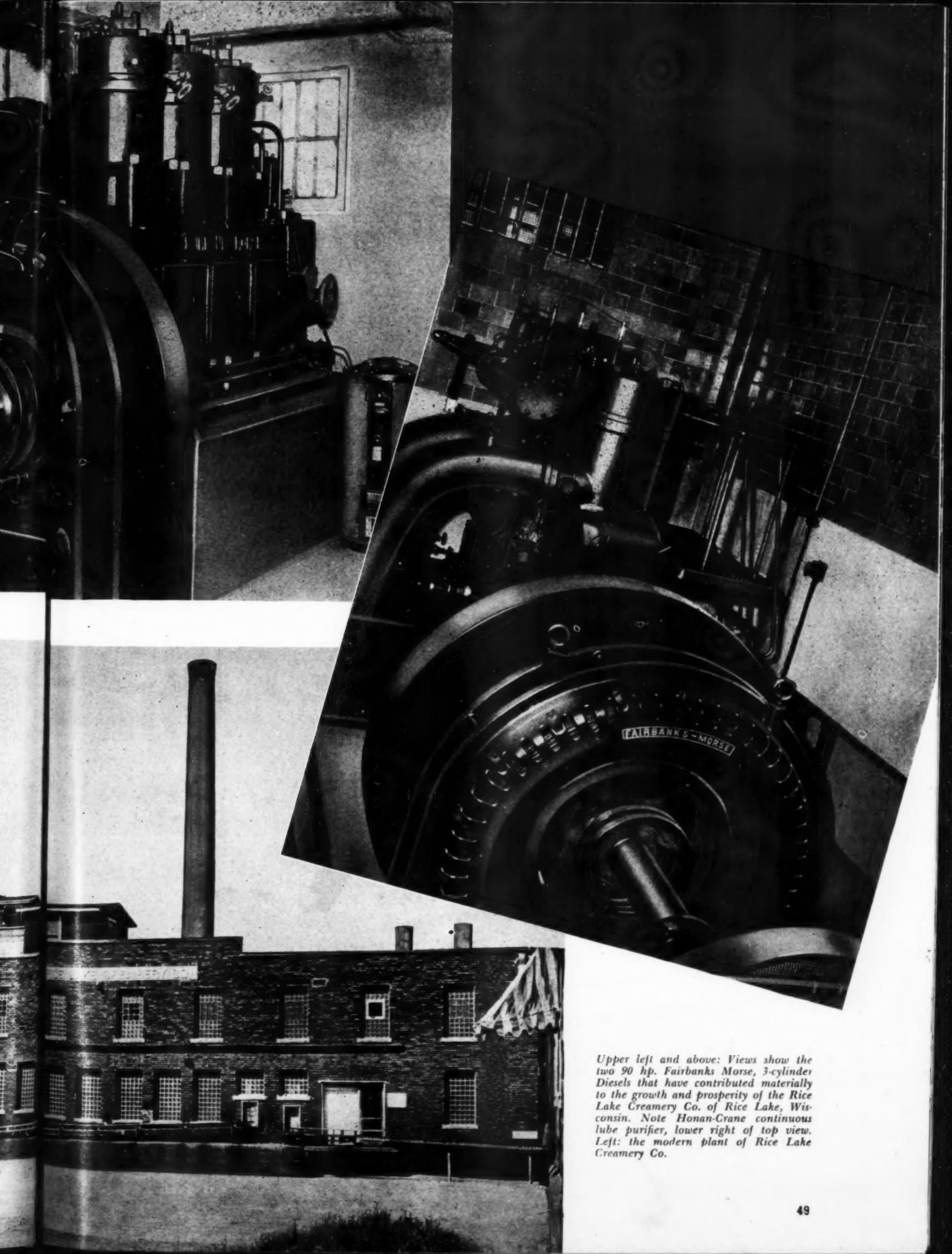
"Power generated here in the plant costs us less than half of what power used to cost when purchased outside," Mr. Gerland says. "The cost now is about one cent a kilowatt hour and the service is more satisfactory. Besides, we own the engines. We feel secure. We are protected against power shut-offs due to emergencies, such as fire and storm, affecting an outside central plant." Other Fairbanks-Morse equipment that has played a part in this drama of an industry includes pumps, motors and scales.

Along with the growth of the creamery has gone the improvement of dairy conditions in Barron County, the gradual retirement of the boarder cow in favor of the high-producing bossy, the replacement of the old, dark, drafty barn by the light, tight, non-leak, comfortable one and the sanitary milkhouse. Farmers supplying milk to the plant have been regarded as coworkers with it, and are credited with having done much toward its success.

Conrad Gerland had a plan in life; he wished to build a family business. All the children, both boys and girls, did odd jobs at the plant from the age of ten. Sole owner for twenty years, the father formed a partnership in 1924, taking in a daughter, Loretta, and a son, Ervin. The latter is now president of the company and the former is secretary-treasurer. When the partnership was changed to a corporation in 1928, another son, Harry, became a stockholder.

More than twenty stars show on the service flag of the Rice Lake Creamery Co. All former employees in service will have jobs waiting for them on their return. In fact, it is expected that with the removal of restrictions on expansion various new jobs will be created.

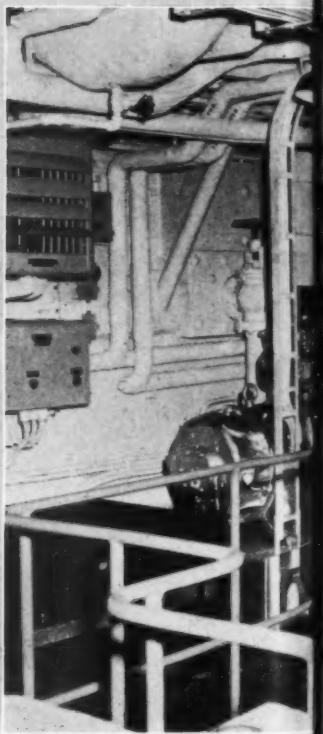
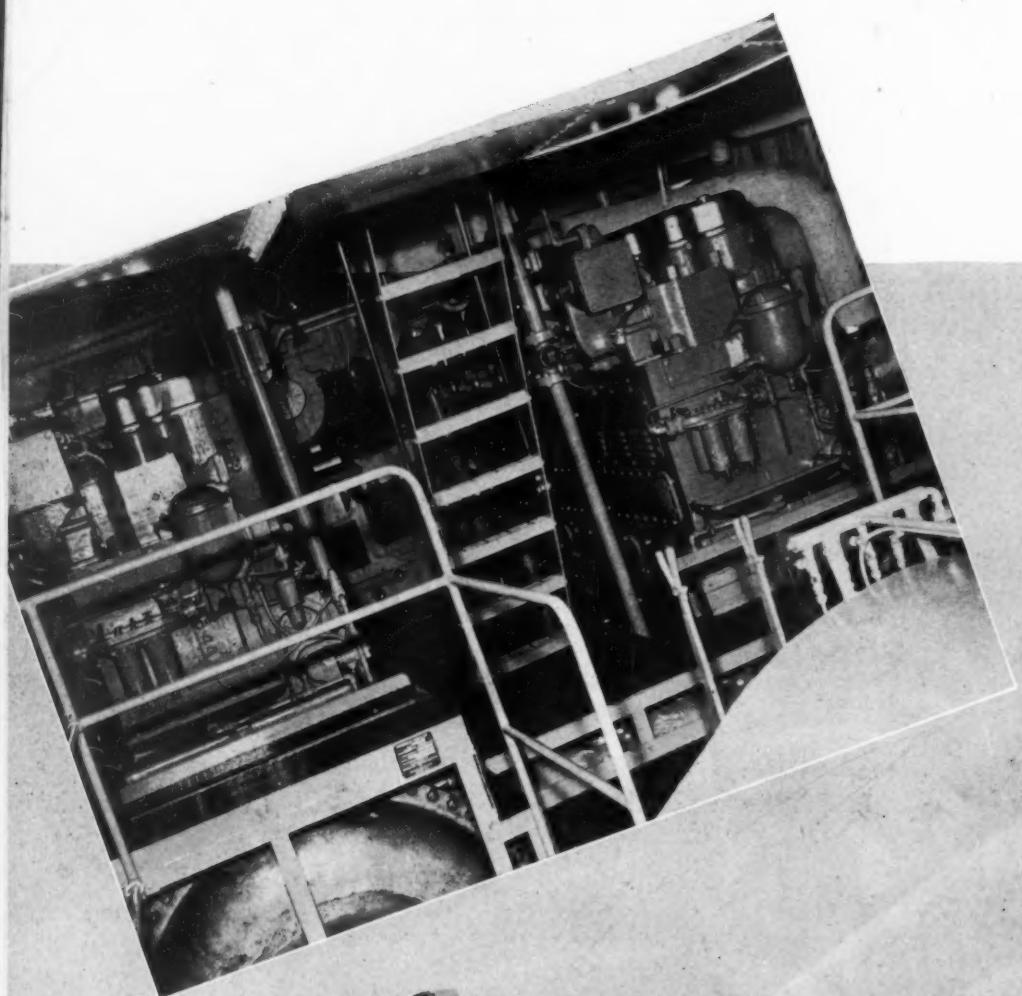




Upper left and above: Views show the two 90 hp. Fairbanks Morse, 3-cylinder Diesels that have contributed materially to the growth and prosperity of the Rice Lake Creamery Co. of Rice Lake, Wisconsin. Note Honan-Crane continuous lube purifier, lower right of top view. Left: the modern plant of Rice Lake Creamery Co.

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YTB DIESEL



*Engines
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Various Sources*

THESEUGS FOR THE NAVY

By WILBUR W. YOUNG

SHE'S good for eighty years . . ." so says the builder of four *YTB*, 110 ft., all wood, Diesel tugs for the Navy. Luders Marine Construction Company's pride of accomplishment was thus aptly expressed with subtle emphasis on the excellence of the design of these vessels, as conceived by Captain W. S. Price of the Bureau of Ships and executed by Cox and Stevens, Naval Architects, as well as the builder's own customary initiative and meticulous care in construction of these crafts.

All wood shipbuilding is not so common, particularly on the East Coast, today as it was even half a century ago and little wonder when we realize that the countryside was scoured for months to find the live oak suitable for these better-than-20 inch-thick hulls of 110 ft. length, 28 ft. beam and 14 ft. 9 in. depth. Solid, sturdy craft, these tugs—thoroughly seaworthy anywhere any time even though they are essentially harbor types.

Main power for the *YTB*'s is a pair of Enterprise 6-cylinder, 635 hp. at 630 rpm. direct reversing marine Diesels fitted with American-Bosch fuel injection pumps, Cuno lube filters, Commercial Ful-flo fuel filters, Alnor pyrometers and Jones Motrola tachometers. The power train as developed for application to a single propeller shaft utilizes a unique combination of the most modern transmission devices.

To trace the power train. The tail shaft of each main Diesel connects to the driven member of an American Blower Hydraulic Coupling of the traction type, that is, the hydraulic coupling is non-disconnecting and has no external pumps or piping. It is entirely self con-

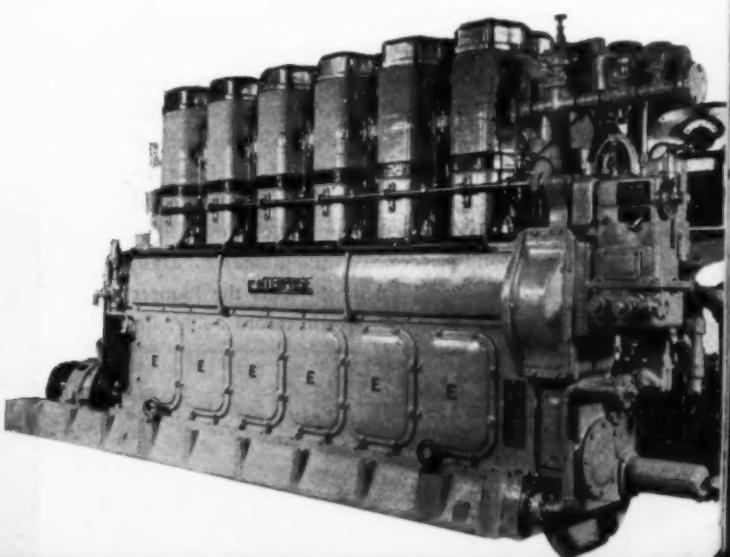
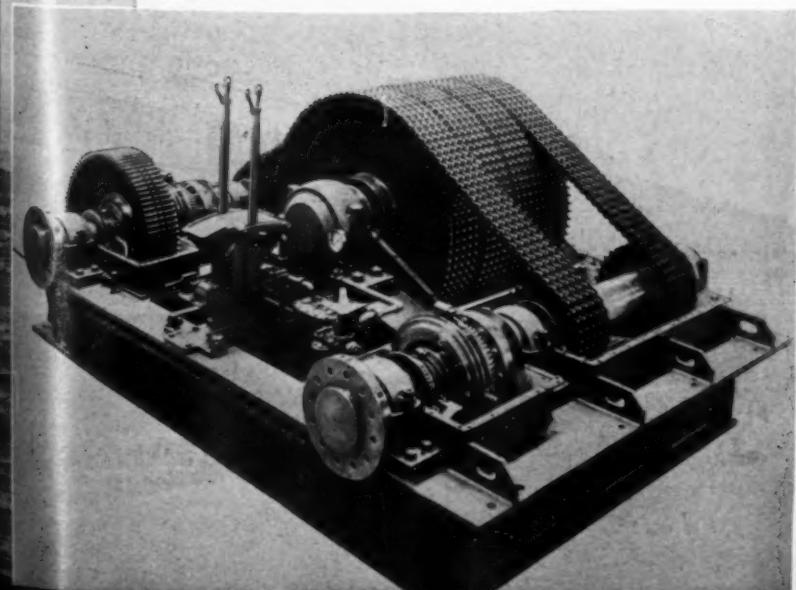
tained and is of light weight pressed steel construction. Selected for this application because of its simplicity, this hydraulic coupling is a vitally important element in the power train, absorbing, as it does, the normal torque impulses as well as shock of the direct maneuvering Diesels.

A Thomas flexible coupling connects the driving member of each hydraulic coupling to the pinion shaft of a Morse Chain double marine transmission unit which combines the power of the two main engines, applying it to a single propeller shaft providing speed reduction on the ratio of 3.2:1. One of the largest of this type of drives, this Morse Chain unit is arranged also to supply power from one engine to drive two Allis-Chalmers turbine type, 2,000 gpm. fire pumps while applying power from the other engine to propel the tug. A Westinghouse Air Brake is fitted to the propeller shaft to speed up maneuvering. All engine and machinery operation is subject to the master's touch through an elaborate installation of Westinghouse Air Brake pneumatic control. Electrical energy for lighting and ship's services is supplied by a pair of General Motors 71 series, Detroit Diesel Division, Diesel generator units both installed on the port side.

Luders had laid the keel for the first of another lot of similar tugs of all steel construction before finishing the fourth wooden hull *YTB*. Of the latter there will be 14; four by Luders, four by Westergard Boat Works, Inc., Biloxi, Miss., four by Everett Marine Ways, Inc., Everett, Wash., and two by Walter E. Abrams Shipyard, Inc., Halesite, N. Y.

Lower left: View of the Morse chain drive showing pinion shaft clutches and pump drive power take-off. Below: Shop view of the Enterprise 635 hp. Diesel—a pair of which powers these tugs.

Upper left: The two main Enterprise 630 hp. Diesels; one of two American Blower Hydraulic couplings seen lower left in this view. Above: Two General Motors Diesel auxiliary generating sets, left, one main Diesel, right.



APRIL, 1934:

The Chicago, Burlington & Quincy Railroad receives the World's First Diesel passenger train—the Burlington Zephyr, a 3 car stainless steel, ultra-streamlined train by Budd of Philadelphia; powered by Winton engines.

MAY 26, 1934:

Now known as the Pioneer Zephyr, this little 600 horsepower train, weighing 112 tons, made its sensational Dawn-Dusk flight over rails between Denver & Chicago to open the Century of Progress Exhibition: TIME: 13 hrs., 4 min. 58 seconds. SPEED: 77.61 mph. breaking all world records.

SUMMER & FALL, 1934:

Fifteen million American citizens came, saw, touched and gasped at this wonder train, on a 25,000 mile exhibition tour of the U.S.A.

NOVEMBER 11, 1934:

The Pioneer Zephyr began its first regular run between Lincoln, Omaha, St. Joseph and Kansas City.

NOVEMBER 15, 1944:

Kansas City Chamber of Commerce commemorated the event with a luncheon there, with Ralph Budd, Burlington President; Edward G. Budd, builder of the train and H. L. Hamilton, Vice President of General Motors, honored guests for the anniversary celebration.

NOVEMBER 15 (evening), 1944:

St. Joseph, Mo., honored the same three Pioneers in Diesel railroading with an evening Chamber of Commerce dinner.

NOVEMBER 16, 1944:

Omaha Chamber of Commerce did likewise with one of their huge world-famous noon meetings.

NOVEMBER 17, 1944:

The little Pioneer Zephyr, calmly unmindful of the unique chapter in world railroad history she wrote, left Lincoln, Nebraska, on schedule, on her busy "milk-run" with mail, passengers, express and a load of people, for her usual morning run to McCook, Nebraska, 228 miles westward, and back again in the wee hours of November 18. On September 1, 1944 the accounting department of the Burlington showed that she had rolled up 1,738,451 miles (asigned), and performed with a mechanical availability of 97.86%. After 10 years the Pioneer Zephyr is still almost a world record holder for



Left to right: Thomas W. Morrisey, veteran of 54 years on the Burlington; Ralph Budd, Pres. Burlington Lines; Edward Flynn, Executive V. P. Burlington Lines. Morrisey brings the Twin Cities Zephyr into Chicago from Savanna, Ill., every other afternoon—210 miles in 2½ hours.

performance. And she still runs nearly 3 miles per gallon on Diesel fuel oil, despite the extra (4th) car that has been added.

Now, in the middle of severe wartime loads for all railroads, the Pioneer Zephyr is doing a more humble job *exactly opposite* that for which she was designed—that of a speedy, local train, making 32 stops in 228 miles and saving money by doing the work formerly done by a hard-pressed, costly through transcontinental train. In 1934 she made the world's fastest time and was built to retrieve lost passenger traffic and provide high speed intermediate service on daylight runs. Now, ironically, she runs in the dead of night, as traffic-wooding as ever, and loaded to the roof just the same. Which proves the soundness of design and the ability of her 8-in. line Diesel plant to flexibly handle jobs

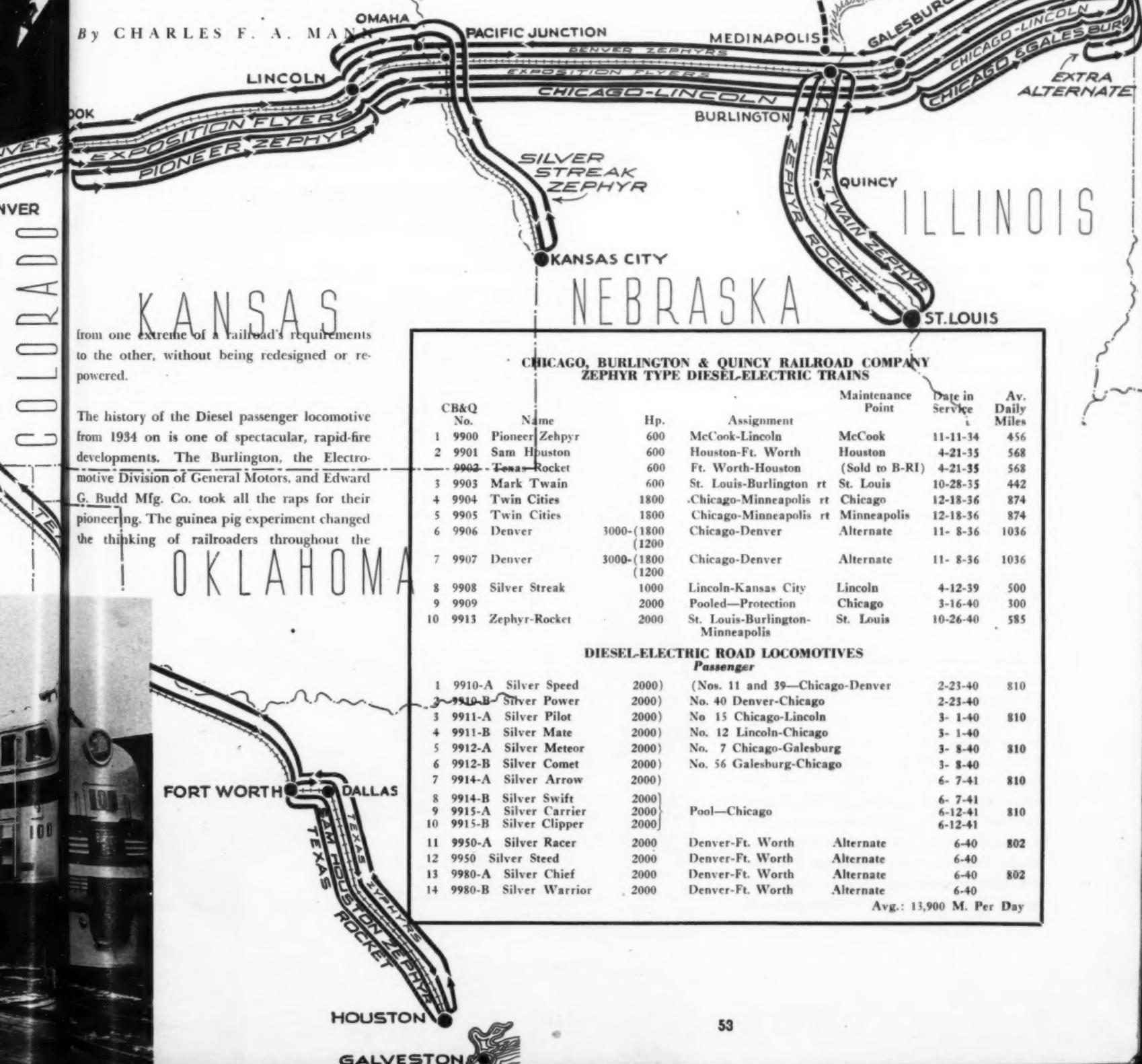
"Daddy of 'em all," the "Pioneer Zephyr," left—and the Burlington's new General Motors 3,700 hp. Diesel freight locomotive at McCook, Nebraska.



**4,000 Diesel Passenger
Locomiles per Day
at Burlington!**

**FORTY-TWO MILLION MILES
OF DIESEL PASSENGER
TRAIN OPERATION**

By CHARLES F. A. MANN



from one extreme of a railroad's requirements to the other, without being redesigned or re-powered.

The history of the Diesel passenger locomotive from 1934 on is one of spectacular, rapid-fire developments. The Burlington, the Electro-motive Division of General Motors, and Edward G. Budd Mfg. Co. took all the raps for their pioneering. The guinea pig experiment changed the thinking of railroaders throughout the

**CHICAGO, BURLINGTON & QUINCY RAILROAD COMPANY
ZEPHYR TYPE DIESEL-ELECTRIC TRAINS**

CB&Q No.	Name	Hp.	Assignment	Maintenance Point	Date in Service	Avg. Daily Miles
1 9900	Pioneer Zephyr	600	McCook-Lincoln	McCook	11-11-34	456
2 9901	Sam Houston	600	Houston-Ft. Worth	Houston	4-21-35	568
3 9902	Texas Rocket	600	Ft. Worth-Houston	(Sold to B-R) (St. Louis)	4-21-35	568
4 9903	Mark Twain	600	St. Louis-Burlington rt	St. Louis	10-28-35	442
5 9904	Twin Cities	1800	Chicago-Minneapolis rt	Chicago	12-18-36	874
6 9905	Twin Cities	1800	Chicago-Minneapolis rt	Minneapolis	12-18-36	874
6 9906	Denver	3000-(1800 (1200)	Chicago-Denver	Alternate	11- 8-36	1036
7 9907	Denver	3000-(1800 (1200)	Chicago-Denver	Alternate	11- 8-36	1036
8 9908	Silver Streak	1000	Lincoln-Kansas City	Lincoln	4-12-39	500
9 9909		2000	Pooled—Protection	Chicago	3-16-40	300
10 9913	Zephyr-Rocket	2000	St. Louis-Burlington-Minneapolis	St. Louis	10-26-40	585

**DIESEL-ELECTRIC ROAD LOCOMOTIVES
*Passenger***

1 9910-A	Silver Speed	2000)	(Nos. 11 and 39—Chicago-Denver	2-23-40	\$10
3 9910-B	Silver Power	2000)	No. 40 Denver-Chicago	2-23-40	
3 9911-A	Silver Pilot	2000)	No. 15 Chicago-Lincoln	3- 1-40	\$10
4 9911-B	Silver Mate	2000)	No. 12 Lincoln-Chicago	3- 1-40	
5 9912-A	Silver Meteor	2000)	No. 7 Chicago-Galesburg	3- 8-40	\$10
6 9912-B	Silver Comet	2000)	No. 56 Galesburg-Chicago	3- 8-40	
7 9914-A	Silver Arrow	2000)		6- 7-41	\$10
8 9914-B	Silver Swift	2000)		6- 7-41	
9 9915-A	Silver Carrier	2000)	Pool—Chicago	6-12-41	\$10
10 9915-B	Silver Clipper	2000)		6-12-41	
11 9950-A	Silver Racer	2000	Denver-Ft. Worth	Alternate	\$10
12 9950	Silver Steed	2000	Denver-Ft. Worth	Alternate	6-40
13 9980-A	Silver Chief	2000	Denver-Ft. Worth	Alternate	6-40
14 9980-B	Silver Warrior	2000	Denver-Ft. Worth	Alternate	6-40

Avg.: 13,900 M. Per Day

world. Soon followed the spectacular fleet of full-size Zephyrs, all of stainless steel and Diesel construction. Then came the detached passenger Diesel locomotive, again based on the CB&Q's historic experiments with articulated trains. Then the detached stainless steel fleets of passenger cars. Then the Model 210 General Motors Diesel, offspring of its one-time cousin, Winton, gave way to the straight V type Model 567. But Burlington's historic pioneering did not stop there, for out of it has grown a mass of technical data on Central-Station vs. Axle Driven auxiliary power for train lighting and air conditioning; wider, rather than narrower and lower passenger cars; Pant-less trucks to make servicing easier; higher engine cabs; new Diesel locomotives; shatterproof glass; not to mention soundproofing ideas; seating arrangements and on into the refined technical atmospheres of metallurgy on various parts of Diesel engines, cast steel wheels, locomotive gear ratios, foolproof heating boilers and improved and standardized specifications on fuel and lubricating oils. And now, on the horizon, looms five separate sets of research effort on creating Diesel fuel oil out of many different things other than petroleum.

Burlington pioneered into every phase of the revolution in motive power that began with the Pioneer Zephyr, direct outcome of frequent visits to the Century of Progress Fair in Chicago by Messrs. Budd and Flynn of the Burlington, to watch the pair of slick straight 8 cylinder Winton Diesels run day after day without stopping, to generate electricity for the General Motors building there. But proudest of all, is the Burlington's on-line experience with Diesels that paved the way for powering America's LCL type landing ships for the Navy, and its part in perfecting the Diesel for America's submarines.

From the Pioneer Zephyr has grown a fleet of 10 stainless steel Diesel Streamliners. Then, in February 1940, came the first of seven 4000 horsepower 2-unit Diesel passenger locomotives capable of being used to haul heavy conventional passenger trains. The Burlington now has 45,000 horsepower of mainline Diesel passenger locomotives and Zephyr-type power plants, operating at over 95% average availability, on 14,000 miles of daily scheduled runs. From 800 to 1,000 miles is the standard daily run of Diesels on the Burlington. This fleet of passenger Diesels—mind you the company also is a huge daily mileage user of switching and freight Diesel locomotives—has piled up 42,000,000 miles of operation, equal to 1680 times around the earth. They have averaged, with

EDITOR'S NOTE: These figures are tabulated to September 1, 1944. The Gross Mileage will reach 42,000,000 before December 15, 1944.
Miles Assigned and Operated, Also Availability of Diesel Passenger Units From Date Placed in Revenue Service to Sept. 1, 1944.

Unit Number	Assigned	Miles Operated	Mechanical Availability
9900	1,738,451	1,701,224	97.86%
9901	2,070,041	1,981,705	95.73
9903	1,649,545	1,598,759	96.92
9904	2,333,802	2,126,219	91.12
9905	2,370,474	2,134,677	90.05
9906-A	2,919,810	2,657,082	91.00
9906-B	2,923,089	2,663,744	90.10
9907-A	2,917,350	2,696,582	92.43
9907-B	2,936,216	2,788,596	94.97
9908	1,041,634	980,204	94.10
9909	1,113,359	1,064,388	95.60
9910-A	1,304,179	1,274,098	97.69
9910-B	1,301,059	1,263,402	97.11
9911-A	1,269,903	1,214,211	95.61
9911-B	1,252,805	1,218,655	97.27
9912-A	1,268,570	1,222,665	96.38
9912-B	1,249,640	1,230,786	98.49
9913	813,830	769,483	97.87
9914-A	880,598	861,591	98.07
9914-B	878,534	852,779	97.07
9915-A	896,067	880,059	98.21
9915-B	907,782	894,274	98.51
9950-A C&S	1,237,495	1,216,894	98.34
9950-B C&S	1,237,289	1,213,702	98.09
9980-A FW&DC	1,241,276	1,227,631	98.90
9980-B FW&DC	1,240,827	1,222,627	98.53
Total & Avg.	40,993,625	38,985,037	95.10%



Two-unit, General Motors 4000 hp. Diesel-electric locomotive leaving Chicago with Burlington's crack "Exposition Flyer."

their 10 Zephyr trains, a gross income of better than \$2 per mile. Arithmetic tells you the dear Public, as much in love with Zephyrs as ever, has poured into the company over \$80,000,000 in revenue via mail, fares, baggage, express and at the Taverns aboard these trains.

So huge has the total Burlington mileage become, that they now think in terms of completely rebuilding their mechanical train parts every 700,000 miles, a theoretical point where each Diesel power plant has earned cash enough to pay for the thorough reconditioning job! This calls for a rebuild job every 24 months. Yet in spite of all this, it is amazing to discover that right now, in late 1944, just how much of the original machinery is still intact, after from 1 to 3 million miles of operation!

By publication date, the twin Denver Zephyrs, with their two 900 and one 1200 hp. General Motors Diesels, will have rolled up over three million miles each—at the rate of 1036 miles per day, from Lake-level-Chicago to mile-high-Denver, on a clockwork basis.

The new Twin Cities Zephyrs, after 8 years of grinding round-trip-per-day service between Chicago and the Twin Cities, have rolled up 2½ million miles of service on a basis of 874 daily miles, one half of which is still the world's fastest scheduled train. And they still clean, service and inspect No. 21 in 15 minutes at Minneapolis, before she starts back at 4 P.M. as No. 24, the afternoon Zephyr!

The seven 4,000 hp. larger size Diesels pull most of the crack name trains between Chicago-Galesburg and Lincoln-Denver. Wartime loads sometimes put 20 heavy cars on the Fast Mail; Exposition Flyer, and the same sizes 9950 and 9980 operate the Texas Zephyr out of Denver on a 98% availability schedule on a fast, many-stop run. The Sam Houston Zephyr and Texas Rocket total 4,000,000 miles. But that's not all! (a forecast). Out of its vast pool of Diesel experience, the Burlington is reliably reported as ready to place more orders for thirty 2,000 hp. passenger units, which can be run as single or double locomotives. Sixty thousand horsepower is 40% more than the Burlington operates now. A rough estimate of known orders, by the way, indicates that there is a reserve list of Diesel passenger locomotive orders that totals over 500,000 hp. upon which commitments are expected momentarily.

The Burlington's Diesel fleet, after 10 years' experience, has given rise to a smooth, efficient and very simple routine for handling maintenance and general overhaul. Because this company pioneered so much of the Diesel passenger railroad operation, and its veteran Mentor, E. F. "Ernie" Weber literally nursed the company into automotive equipment and on up to now, the company worked its Diesel operations right into the shops and terminal facilities as they existed when steam power ruled the rails. Mr. Weber became superintendent of Automotive Equipment in 1921, for the Burlington, and under him the old "gas" car, first with gearboxes, then electric drives, and finally into the Diesel Zephyr era starting in 1933-1934. No special Diesel facilities have been built until this year, for the simple reason that efficient, long-established Burlington shops have been able to work up satisfactory Diesel procedures. However, starting last summer, the company began thinking of its new Diesel pattern, what with its rapidly growing fleet of switchers; then its freight Diesels, all growing while the war-limited passenger units remained about the same as they were in 1941. The chart shows the servicing points for all passenger units. Now, with rapid expansion, perhaps 200,000 new Diesel horsepower in sight within the next 24 months, the Burlington is setting up three distinct shops to handle the majority of all its Diesel work. The Clyde shops near the outskirts of Chicago, are being enlarged to handle major running repairs on all classes of Diesels. Because so many passenger units operate naturally into Chicago, this point will take the brunt of this class of work. The present program of expansion at Clyde shops calls mainly for expansion of building facilities. Denver, because of its terminal status for both the Chicago and Texas lines, also the Montana freight operation, will have considerable changes and enlargement of track and buildings to handle from 4 to 10 Diesel units per day. At Burlington, Iowa, one of the three historic cities that gave the company its name, the large general shops there will get a \$500,000 addition, mostly machinery and equipment, to perform all Diesel and electric work. Here the complete rebuild jobs; armature and other major electric work that has to be done when the Diesels are taken completely out of service. The West Burlington shops are the key major overhaul point for all Burlington motive power. Ideally located, geographically, they form the nucleus of heavy mechanical repair facilities for the entire system. Equipment storage; purchasing and disbursing is largely done from this key point. And it is not far from Galesburg, focal point of freight handing and switching.

Single-unit 1800 hp. Diesel locomotive with the Burlington 7-car Twin Cities Zephyr near East Dubuque, Wisconsin. She has done 2½ million miles since December 1936.





The Burlington Route Twin Cities Zephyr entering the Chicago yards.

No maintainers are carried on any of the Burlington locomotives, and all work is scheduled at terminal points which, in the case of the Twin Zephyrs and Denver Zephyrs, means either a 10 P.M. to 7 P.M. or a 10 A.M. to 4:30 P.M. time limit on everything, including changes of valves, rings, pistons, liners and even replacement of whole trucks and generator units. Cylinder liner wear averages 1/1000 of an inch every 30 days. Inspection is made of liners every 100,000 miles of operation. Regrinding is done at the Electromotive plant at La Grange on the usual exchange basis, and after 3 wearing periods, the original and 2 regrinds, generally between 700,000 and 800,000 miles, the liner is replaced. The old high pressure injection system on the No. 210 engines has been replaced and all now operate at 16,000 lbs. maximum injection pressure. Traction motors are changed every 200,000 miles at the electrical shops at Aurora. Burlington experience has found, speaking cumulatively, that top piston rings are good for 100,000 miles; valves, 450,000 miles; scavenging blowers—bearing changes about every 800,000 miles, the rest indefinitely. Crankshafts are good for 2½ million miles, with regrinding at about 1,200,000 miles. The new Allison metal lined connecting rod bearings seem good for 500,000 miles. The improved Electro Motive traction motors look like they'll last for 500,000 miles—double that of the earlier Zephyr traction motors. And so it goes through the marathon of limits of serv-



The Denver Zephyr, overnight train between Chicago and Denver; twin trains each passed 3,000,000 mile mark October 1944.

ice and/or wear on every part of the Diesel locomotives. One Burlington official in Mr. Murphy's Motive Power Department estimated the company would have had to spend twice the capital outlay for old fashioned, slower steam powered equipment, than it spent on its ten Zephyrs, and such old-order equipment would render only 60% of the service given by the Zephyrs and would produce less than half the gross daily income and one third the net

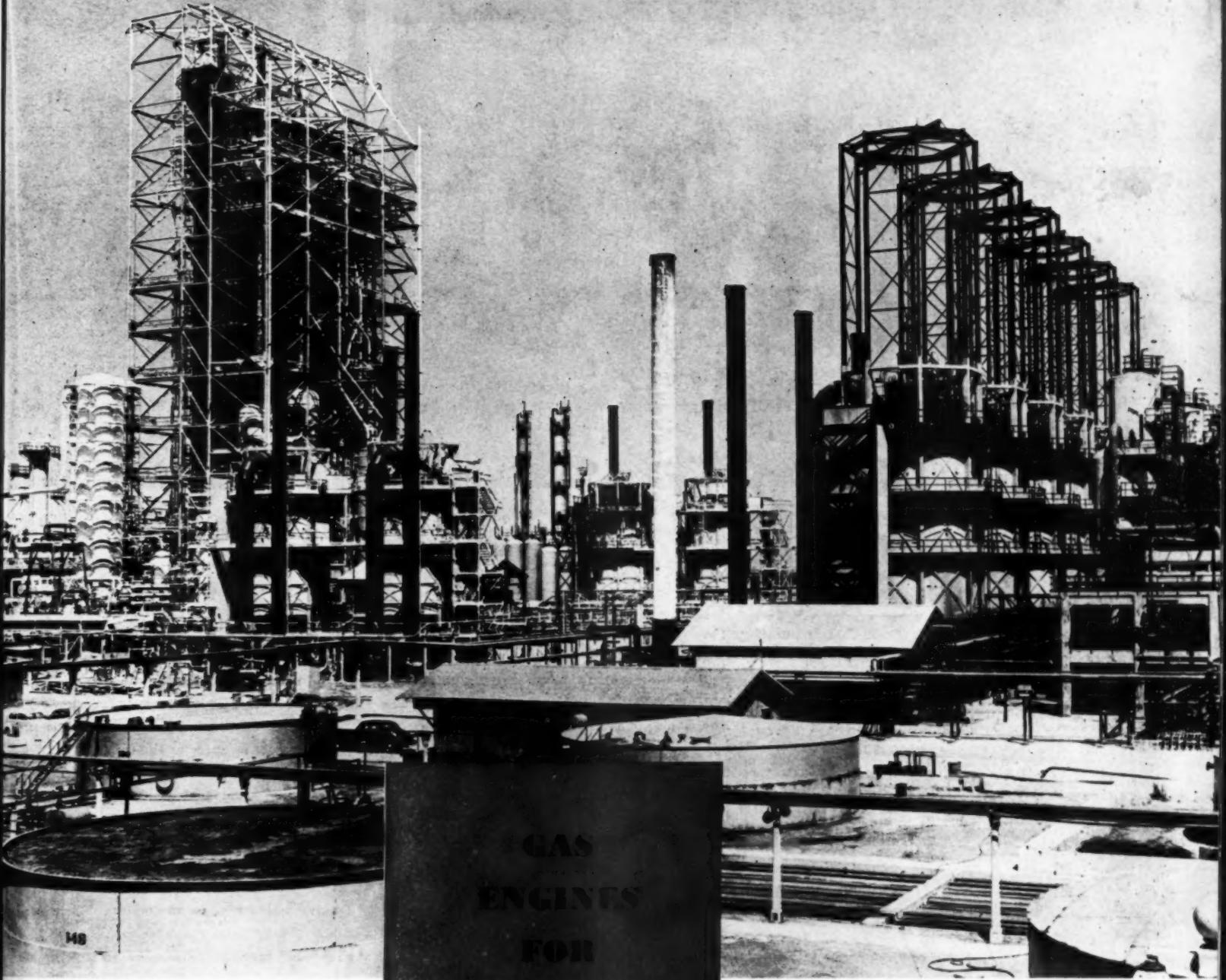
income now coming in from the company's Diesel passenger fleet!

Think this swift calculation over, and you arrive at the startling conclusion that ten Zephyr trains actually keep the major segment of the company's 1944 war effort rolling. Ten trains on a 11,000 mile railroad, plus the yeoman help of seven 4,000 hp. heavy duty . . . And now please turn to page 94 . . .

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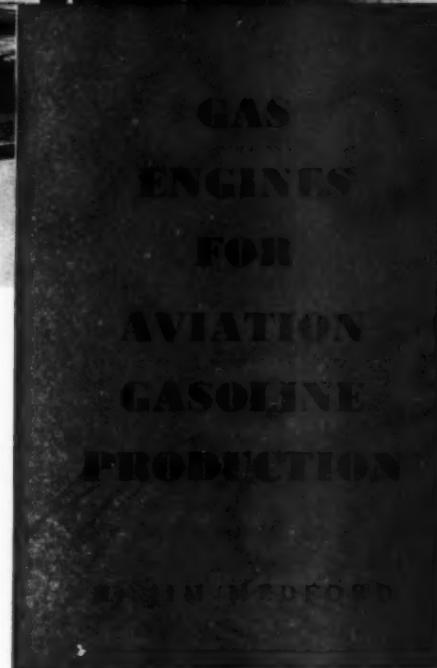


General view of the Richfield Oil Corporation 100-octane refinery at Watson, California.

BACK in the year 1854 the first "refinery," a coal-fired still with a daily capacity of six barrels of usable lubricating oil, was put into production. Ninety years ago gasoline was an unknown word—so was catalyst—it was grease they were after.

Fifty years later, kerosene was the favorite. Production of this modern lighting fluid was 1,000 barrels to every 100 barrels of the runt, gasoline. Today, this condition has been reversed, and how! Gasoline has become the "King of the Hydrocarbons," with the trend toward the chemist's dream of a barrel of gasoline from a barrel of crude petroleum.

Now, ninety years after the "six-barrel refinery," by catalytic refining the modern petroleum factory is within ninety per cent of its goal.

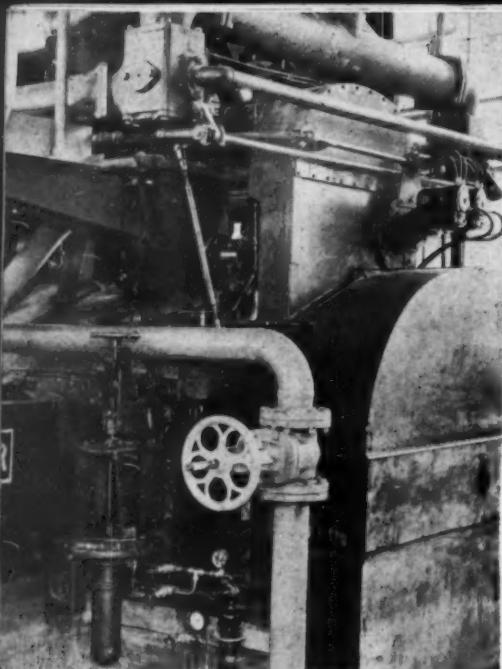


It is getting from a barrel of that black and unpleasant smelling combination of carbon and hydrogen—crude petroleum oil—nine-tenths of a barrel of gasoline. You know—the stuff about which you once could say to the service station man: "Fill 'er up, Bud!" And—no coupons.

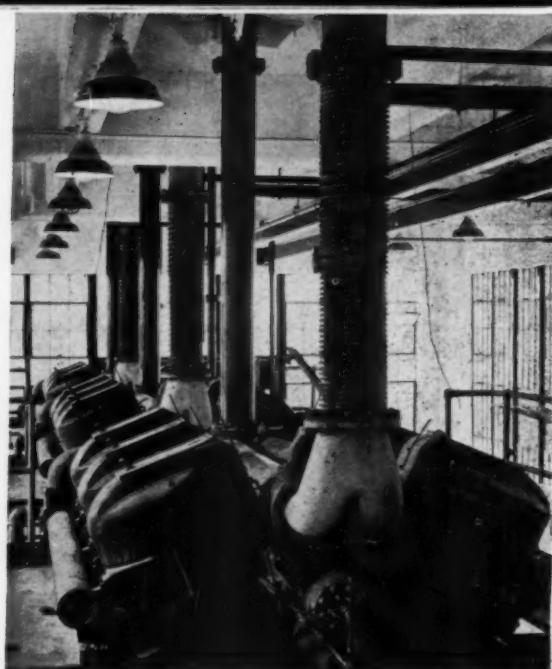
Modern in every respect, the recently completed 100 octane aviation gasoline refinery of

the Richfield Oil Corporation at Watson, California, employs the Thermoform Catalytic Cracking (T.C.C.) process. Developed by Socony-Vacuum engineers, the catalyst moves countercurrently through the cracking chamber, passes out to be regenerated in a separate chamber and re-enters the cracking chamber in a continuous stream. There is no shutting down of the reactor for cleaning; it is constantly on stream.

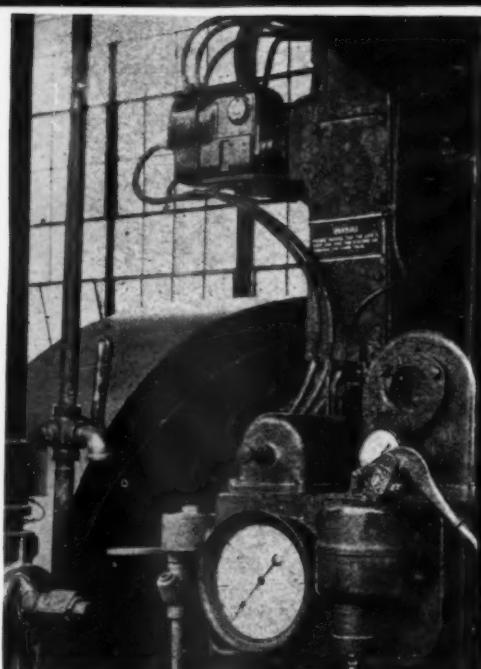
Both on the skyline and within the plant, the huge 240-foot high T.C.C. unit makes the major contribution to the refinery's increased output of 100 octane. By a two-pass operation using a natural clay catalyst in the first section and the new magic synthetic beads in the second, an aviation base stock is produced which, without further treatment, nearly meets the high quality



Close-up of the operating end of the Ingersoll-Rand angle compressor equipped with Pickering Governor and American-Bosch magneto.



Top view of three I-R angle compressors. Note the Dresser flexible exhaust connection.



Close-up of U. S. vacuum gauge, Bijur "one-shot" valve lubricator and American-Bosch magneto.

requirements of 100 octane aviation fuel. In addition, butylenes and isobutanes are produced in quantities sufficient to yield far more than enough alkylate to blend the catalytic base stock to 100 octane aviation gasoline specifications. The excess alkylate permits the inclusion of additional straight run gasoline in the aviation blend so that the contribution of the catalytic unit to 100 octane production exceeds the actual production of stocks therefrom.

One of the sections is arranged for cracking virgin oil and the other for treating (or reforming) the product from the cracking operation. Each section consists of two reactors, two Jeffrey elevators of 150 tons per hour capacity and a Thermofor kiln. The latter is used for burning off carbon deposited on the catalyst during the reaction.

Each section is equipped to handle 600 tons of pelleted catalyst in a continuous cycle with separate but identical equipment. The regenerated catalyst entering the reactor feed hopper at the rate of 150 tons per hour flows downward through two solid bed reactors operated in parallel. Here it is contacted with the vaporized and superheated reactor feed stock, the catalytic cracking reaction takes place, converting the charging stock into many components required for the production of aviation gasoline. Since catalytic cracking is necessarily carried on at a pressure only slightly above atmospheric, compression of the wet gas is resorted to in order to facilitate butylene recovery. For this purpose a battery of six, 6-cylinder, 4 cycle, 15½-inch bore 18-inch stroke, 600 hp. at 330 rpm. Ingersoll-Rand gas-driven-angle units were installed.

These units receive their charge of wet gas from the T.C.C. unit at about 10 lbs. pressure. After compression to 145 lbs., the compressed gas is co-mingled with the distillate from which it was originally separated. This is done in order to reduce the volume of gas to be handled through a conventional absorber tray tower where it is intimately mixed with a petroleum fraction of about the boiling point of kerosene (350-550 F.). This mixture, usually referred to as a fat oil, is pumped to a fat oil still, or furnace, and flashed to a stripper where the gasoline vapors are taken out overhead to a stabilizer and the lean oil (absorption oil freed of gasoile) is re-cycled to the absorption tower for re-use.

Fitted with identical power cylinders, 15½ in. bore 18 in. stroke, the engine-compressors are single-acting gas engines with crosshead-type double-acting compressor built into a single, heavy-duty unit assembly. Each compressor-cylinder crosshead and each pair of power cylinders has a separate crack throw. The heavy forged steel heat-treated crankshaft is supported by centrifugally babbited, interchangeable steel-shell main bearings with shim adjustment.

Bottom shells have bored seats in the frame; top shells fit in bolted-down caps, mortised in the frame. Connecting rod bearings are of similar type and both piston-pin and crosshead-pin bearings are solid, high-grade bronze bushings.

Power cylinders have removable wet-type liners of alloy cast iron with highly finished honed bores. The water joints at the top and bottom are sealed with synthetic rubber rings which

are resistant to oil, water and heat. The bottom joint has a water trap and tell-tale connection. It is impossible for water to leak into the crankcase. The liner supporting shoulder is well down, eliminating excess metal and providing a cooling space at the top.

The cylinder heads have heat-resisting alloy inlet and exhaust valves with chromium-plated stems. Valve stem guides and exhaust valve seats are replaceable. Double valve springs are used. Roller-type tappets have replaceable guides and all valve mechanism is enclosed.

The alloy-cast-iron pistons are fitted with four compression rings and two oil-control rings. Piston pins are full floating, running in replaceable bronze bushings in the piston. An oil spray from the top of the connecting rods acts as a cooling agent.

An economical fuel system is a feature of these engines. It consists of a sensitive low-pressure fuel regulator, a fuel gas cock, constant-quality mixing valves which automatically maintain the mixture at the most economical point at all loads and speeds, and a manifold design for even distribution to all cylinders. Reliable ignition is provided by two American Bosch induction-type magnetos with impulse starters.

For high standard force-feed lubrication, a spiral-gear oil pump, direct-connected to the crankshaft, supplies pressure lubricant to all bearings including crosshead shoes and rocker arms, governor parts, magneto drive, etc. Continuous oil filtration and cooling reduces bearing and oil maintenance, and provides piston cooling by means of sprays from end of the

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connecting rods. Power valve stems have "one-shot" lubrication from a central lubricator. A separate force-feed lubricator has individual, adjustable sight-feeds to each compressor cylinder and stuffing box.

The centrifugal governor is fitted with a constant speed and pressure control. Safety devices are provided to cut out the ignition in case of over-speeding, oil pressure failure, etc. Two stage, electric-motor-driven compressors supply starting air at about 200 lbs. An air distributor connects, in proper sequence, to check valves in the power cylinders.

For instrument service there is a separate steam-driven compressor with specially fitted carbon piston rings in compressor cylinder and having a carbon rider ring for piston support to eliminate the possibility of lube oil contaminating the air. This is one of the few such compressors installed in California industry, according to the manufacturers.

Because of the average reader's interest in the production of 100 octane gasoline for fighter planes, it is well to mention here that Richfield's modern refinery includes the production of the new hydrocarbon—cumene. To get a jump on the Nips, right after Pearl Harbor the polymerization unit was quickly converted into a cumene unit by using salvaged material thus saving critical materials and construction time.

Cumene is a new blending agent, the inclusion of which in 100 octane has made it possible to increase the volume of this vital fuel by nearly 23% although the percentage of cumene in the finished blend seldom exceeds 8%.

It is produced by the chemical combination of benzene and propylene, and again the catalyst plays its important part. Benzene plus a propane fraction, originating in the thermal and catalytic cracking operations, is vaporized then passed through a bed of solid phosphoric acid catalyst. The effluent from the reactors, consisting of propane, cumene and excess benzene, is fractionated in three steps. In the first tower propane is removed; the second column removes the excess benzene for recycling to the reactor, and the third cuts cumene of aviation boiling range from the synthesized raw stock.

The production of cumene in the aviation boiling range is as modern as B-29 Superfortresses. It is so new that even the most recent textbooks on aviation gasoline refining offer but a hint as to its importance in petroleum chemistry. It makes "fighting gasoline."

Bijur "one-
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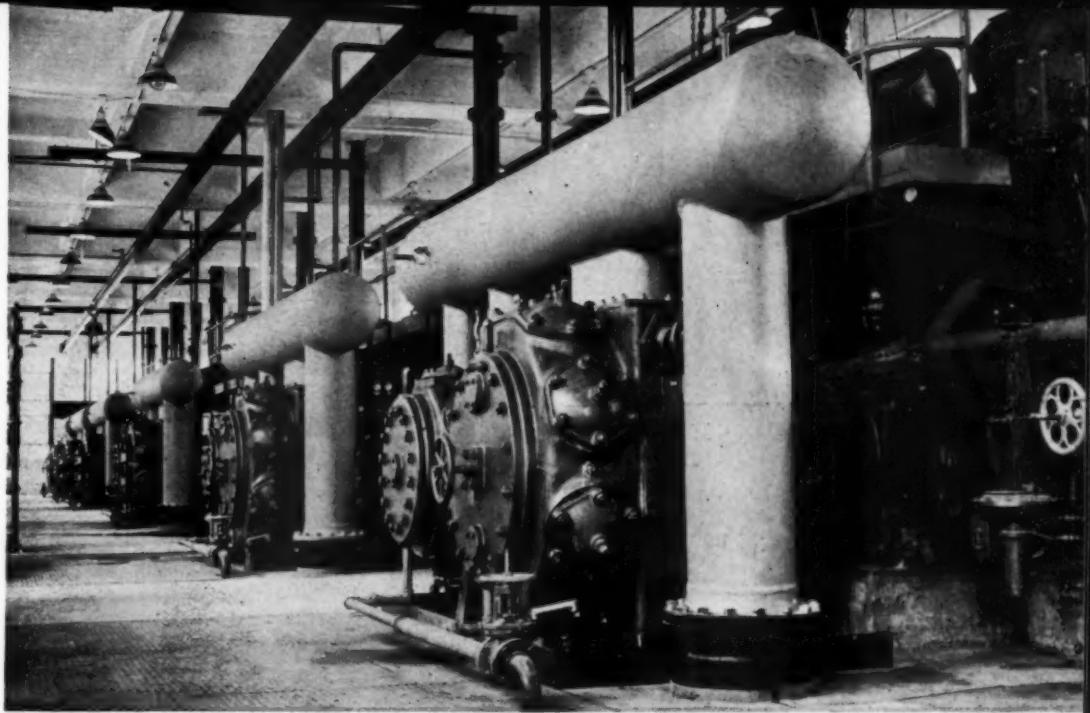
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View looking down a line of compressor cylinders. There are six Ingersoll Rand, gas-burning angle compressors of 600 hp. each in this plant.

The area of this plant is 360 acres or a square mile. It was one of the first in Southern California to manufacture 100 octane, the present refinery costing up to \$40,000,000. Construction workers numbered 2,300, with permanent employees now about 1,000. New machinery installed includes 140 pumps, 77 turbines, 35 motors, 153 exchanger units and 108 towers and tanks.

Because of the many high-altitude structures to be erected in the construction process, special derricks had to be created. One "Big Bertha" had a main boom capable of handling loads of 300 tons on a 50-foot radius and by use of boom extension lifts were possible to a height of 355 feet or approximately 35 building stories.

Aviation refinery construction is America's big

contribution to the war effort, the high octane gasoline of which will play an important part when gasoline coupons are mere museum pieces. And in there, playing no small part are the giants of modern industry, the gas-driven-angle compressor units, a necessity in every refinery and wherever natural gas is distributed.

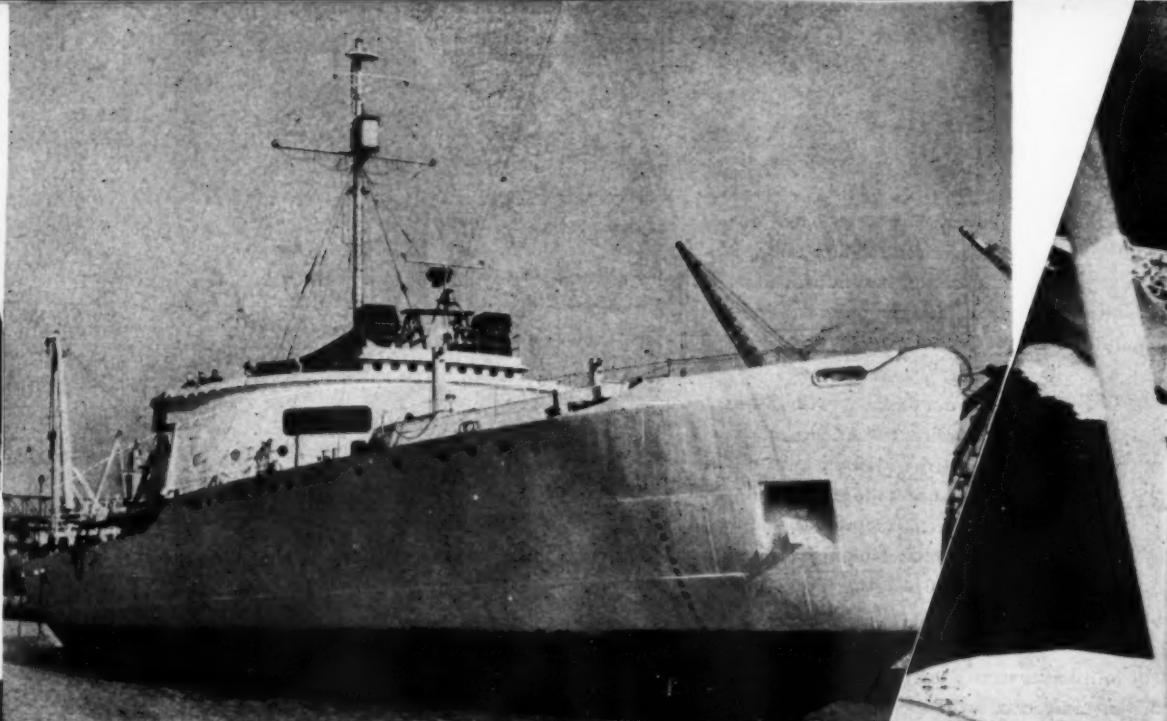
Equipment in the plant includes Ingersoll-Rand heat exchangers, pumps and auxiliary compressors, Crane valves, Cuno and Nugent lube oil filters, Mercoid controls, Dresser flex connections, American Bosch magnetos, Torrington lubricators, U. S. gauges and thermometers, Pickering governors, Yale hoists, American Hammered piston rings, Maxim exhaust silencers, American air filters, Fluor and Foster-Wheeler induced draft cooling towers and General Electric motors.

In the foreground are a pair of 2-stage compressors which supply engine starting air. Background: One of the I-R compressors—note Cuno and Nugent filters attached to unit.

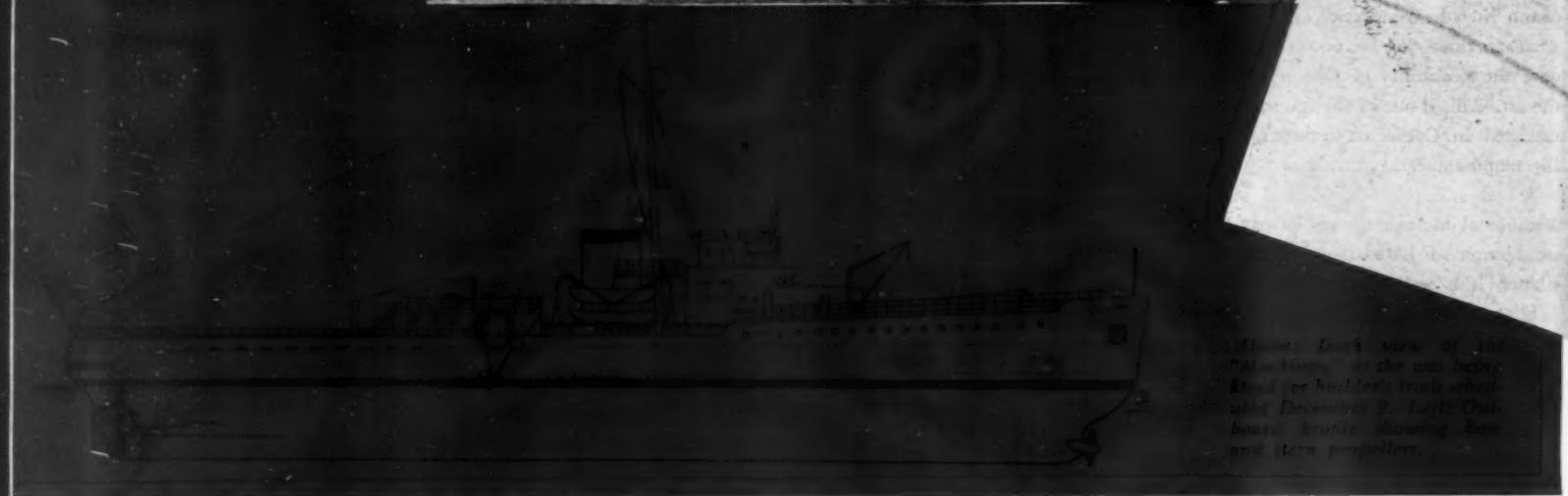




Commander Edwin J. Roll,
and, U.S.C.G., prospective
master of the "Mackinaw."



Above: Front view of the ship as it is being fitted or broken trials scheduled December 9. Left: Outboard profile showing bow and stern propellers.



Airplane
Ice
modifi

DIESEL ELECTRIC COAST GUARD ICE BREAKERS

By DWIGHT ROBISON

THE Coast Guard Ice Breaker *Mackinaw*, described as the sturdiest ship ever built on the Great Lakes, was constructed by the Toledo Shipbuilding Company at Toledo, Ohio, is now undergoing trials, and will be in service when this appears in print. This 290 ft. vessel will assist Great Lakes Shipping by breaking ice at the opening of the navigation season. The vessel has a 75 ft. beam and unusually heavy plating measuring $1\frac{1}{2}$ in. at the ice belt, $\frac{1}{2}$ in. above the ice belt and $1\frac{1}{8}$ in. along her bottom.

Unique in design and construction the *Mackinaw* is of the same class and design as the Coast Guard's "Wind" ice breakers—*Northwind*, *Southwind*, *Eastwind* and *Westwind* — the "Wind" vessels being built for salt water serv-

ice. The Great Lakes ship has more beam, is longer and draws less water (18 ft. 10 in.) than her sea-going prototype.

All are, however, identically equipped as to prime movers and propulsion—being Diesel-electric. Although rated at 10,000 hp., Coast Guard officials believe the ships may develop up to 13,000 hp. Main propulsion is accomplished by six Fairbanks-Morse, 10-cylinder, $8\frac{1}{8}$ in. x 10 in. opposed piston Diesels each driving a 1375 kw., Westinghouse direct current generators. One of the outstanding features of these vessels is the forward screw which can rotate to advantage in either direction—it can be used to cut ice or to create a wash or vacuum, depending on its rotation, to clear packed

ice. This bow propeller is driven by a 3300 shp. electric motor while the two stern propellers are powered by a pair of 5000 shp. motors. It is believed that this successful application of a number of large direct-current propulsion generators, connected in parallel, supplying power to a single motor, will result in a definite trend toward this type of installation. Auxiliary power, for lighting and ships services, is supplied by four Fairbanks-Morse, 6-cylinder, $5\frac{1}{4}$ in. x $7\frac{1}{4}$ in. opposed piston Diesel engines, driving 220 kw. Westinghouse generators, two of which are for regular service and two for standby.

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Airplane view of a seagoing "Wind" class Coast Guard Ice Breaker, prototype of the "Mackinaw" with certain modifications.

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for rapid change in trim for the vessel. Should she become frozen in the ice she can be brought from a hard port to a hard starboard list in 80 seconds and this radical movement of the ship is calculated to shake her loose. Forward and aft trimming tanks are also provided for the same purpose. The ice-breaking bow is of a cut-away design to permit the vessel to ride up on the ice. If the weight of the bow does not break through the ice, the forward ballast tanks can be rapidly filled to provide additional weight. She carries two, 12-ton cranes to handle aids to navigation, also a towing machine aft.

Here are further statistics and facts indicative of the strength and fitness of these ice breakers for the job they have to do. There is 150 miles

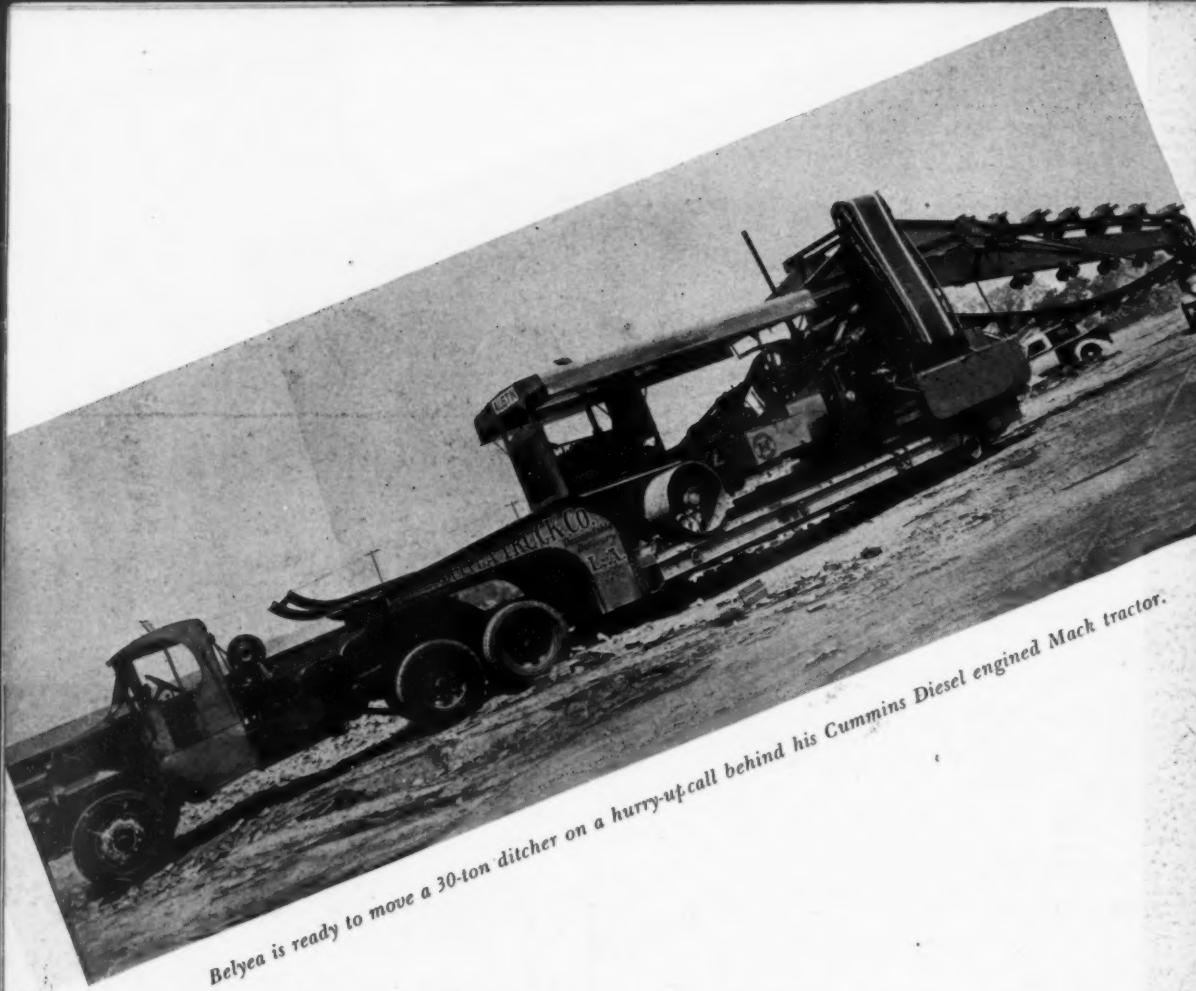
of single bead welding throughout the vessel—not a single rivet was used in the entire hull structure. Fuel oil capacity is 440,000 gallons. Grossing 5,090 tons, she has facilities for about 400 tons of cargo and provisions for six months. Regular complement will be 12 commissioned officers and 164 enlisted men in crew. She is insulated against 30° below zero. The ship is rugged and powerful enough to tow large ships while performing her main job of breaking ice. Still another unusual feature is the notched stern to permit entry of a freighter's bow and thus assist by pushing.

A resident Coast Guard inspector at the Toledo Shipbuilding yard informs us that a vessel provided with a forward propeller, as is the Macki-



naw, is designated as the Baltic type, because it is in the Baltic region that ice breakers thus designed are operated by the Swedes, Russians and Finns.

In the summer months the *Mackinaw* will be used to handle the heaviest buoys on the Great Lakes, to carry oil to distant lighthouses, to serve as a training vessel and to do any salvage work that is necessary. Present plans call for the ship to be berthed at Cheboygan, Michigan, this winter. The "Wind" class, sea-going ice breakers, four of which have been commissioned, are being built on the West Coast by Western Pipe and Steel Company.



Belyea is ready to move a 30-ton dumper on a hurry-up call behind his Cummins Diesel engined Mack tractor.

By JIM MEDFORD

WHAT an 800-ton two-story, stocked warehouse moved? Or, a mirror, of, say 200 inches and 35 tons, placed atop a mountain? A 90-foot, 350,000-pound oil tower delivered to a refinery? Not to mention spotting an 80-foot over-all highway train on a movie set so a cameraman may shoot the he-ro-ine in just the right pose for the ultimate in appeal from the whirley's 26-yard boom?

Get, then, Belyea of Los Angeles, California; the trucking brothers that do it in the Diesel way. When they began with horses, or rather with one horse, just thirty years ago, the present "head man," Byrnn Belyea, was at the ripe old age of fifteen and well on his way. Because of a "spark plug" that never grew cold, he wore out the animal in one week. And to this day he is always one jump ahead of the outfit he heads. He has to be to keep from getting run over. His big Blue Ox, Babe, is the 100-ton whirley on the pictured jeep with a boarding-house reach of thirty axe handles.

Fleet operation is a matter of units, 385 of them; 70 per cent of which are jeeps, trailers, low-bed semis and special long arm cranes, tankers and shovels. Loads range from 25 tons to 120 tons plus. And leading them around are 33 Diesel road tractors and trucks—heavy duty replacements of Byrnn's single horse-drawn, high-seat "dray."

This Paul Bunyan in industrial transport went automotive in late 1919 with the purchase of a two-barreled, under-the-seat "fire" wagon that Byrnn's brother Jack learned to drive about the time the big railroad strike hit the country at the height of the canning season in California. The Belyeas served the canneries.

Then came the Southern California oil strike in Los Angeles county and to the growing Belyea fleet was added a crane, battle-scarred (AEF) and of questionable vintage. But by plenty of cussing and an excess of perseverance, the Belyeas, now three as Bob had joined up, drove it hard until it folded in 1924.

That year the Belyeas became four, George came in. They began to go places. A 50-ton low-bed was added, and then followed shovels and things that hauled and hoisted. It was up the old Mount Wilson toll road they took this 45-ton digger to build passing sections along the one-way stretch of scenic threat. And for Hollywood's water sets, they used it to dig Malibu Lake where a swamp had once been. Now complete with beaches, wharfs, bunds, embankments and quays. Even islands, are included—typical of that make-believe land.

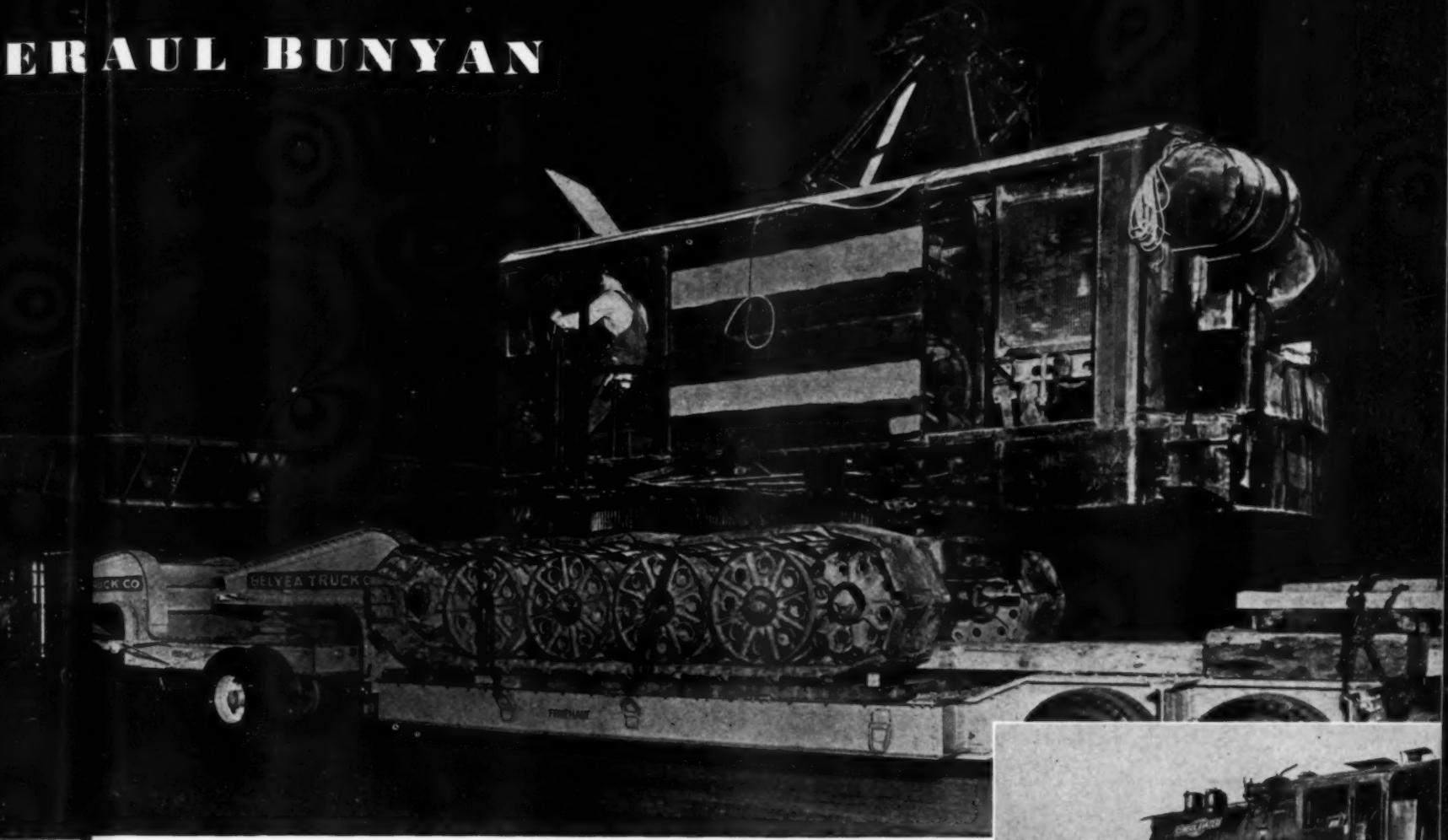
But the easiest money they ever "lifted" was when an outfit decided to move its safe-deposit boxes across a busy downtown Los Angeles

street. The 60 million dollars made the crossing safely over the heads of the indifferent passing throng. Two whirlies passed the "bucks" in two-ton jags, the natives thinking it was maybe woolen underwear or Hollywood doing chamber-of-commerce stuff for foreign-trade day. Instead, it was the real McCoy, off the record and un-OPA.

To do big things, these Belyea boys think big and buy big. To haul the 200-inch telescope mirror from rail to Cal-Tech's grinding shop and this world's largest lens up Palomar Mountain in San Diego county, they used a 74-foot jeep with its dolly behind a Diesel road tractor. Eleven feet three inches wide, with a capacity of 120 tons, it rolls on 34 rubber tires. They used it, too, to give Los Angeles a new 100-ton electric transformer.

Disasters—earthquakes, floods, fires—the Belyeas are in the midst of the worst. Street cleaning, bridge salvaging, mail carrying, it's all in the day's work, most of it at night, because you can't move equipment through a city's streets any other time, when it sweeps the trolley wires and uses most of the width between curbs when passing.

ERAUL BUNYAN



Most jobs like this have to be moved at night. This is a 6-ton whirley crane on a combination low-bed Fruehauf trailer. Both crane and road tractor are powered with Cummins Diesels.

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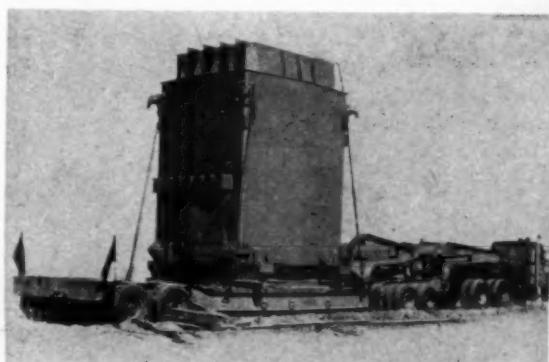
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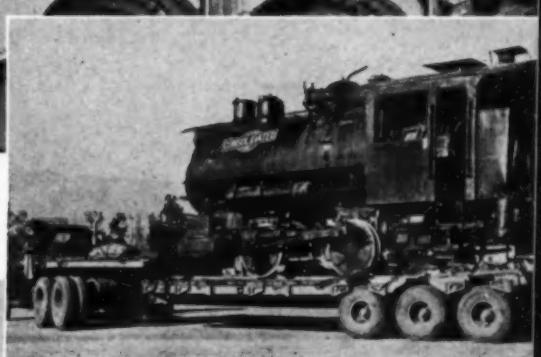
But behind all the spectacular, the miles through busy city streets and over concrete country ribbons, is the mechanical department—the division of maintenance that performs behind the asbestos curtain and footlights. It's run by Earl Bender, a grey-haired, quiet spoken technician that gives the Belyea-Four the Diesel horses that move ships and tanks and guns and machines for industry—war and civilians.

These Diesel horses are represented by 150 Cummins Automotive Diesels, 72 of which are over-the-road in trucks and tractors and the balance supply the power for derricks and other heavy lifting units. Many of these Cummins Diesels have been in service for more than ten years with up to 10,000 miles per month for the road Diesels, making a Johnny Walker life of close to the 1½ million miles and still going strong. Rebuilding is at no set times or mileage. They get it when they need it.

Maintenance is complete and prompt. Cylinder sleeves are replaced at .010-.012, pistons are given .006 clearance and pistons discarded when sleeves are changed. Crankshafts are replaced at .005 out of round by regrinding and the use of undersized bearings.



Bulky and heavy—a 108-ton transformer for the City of Los Angeles.



Transporting a steam locomotive by Diesel.



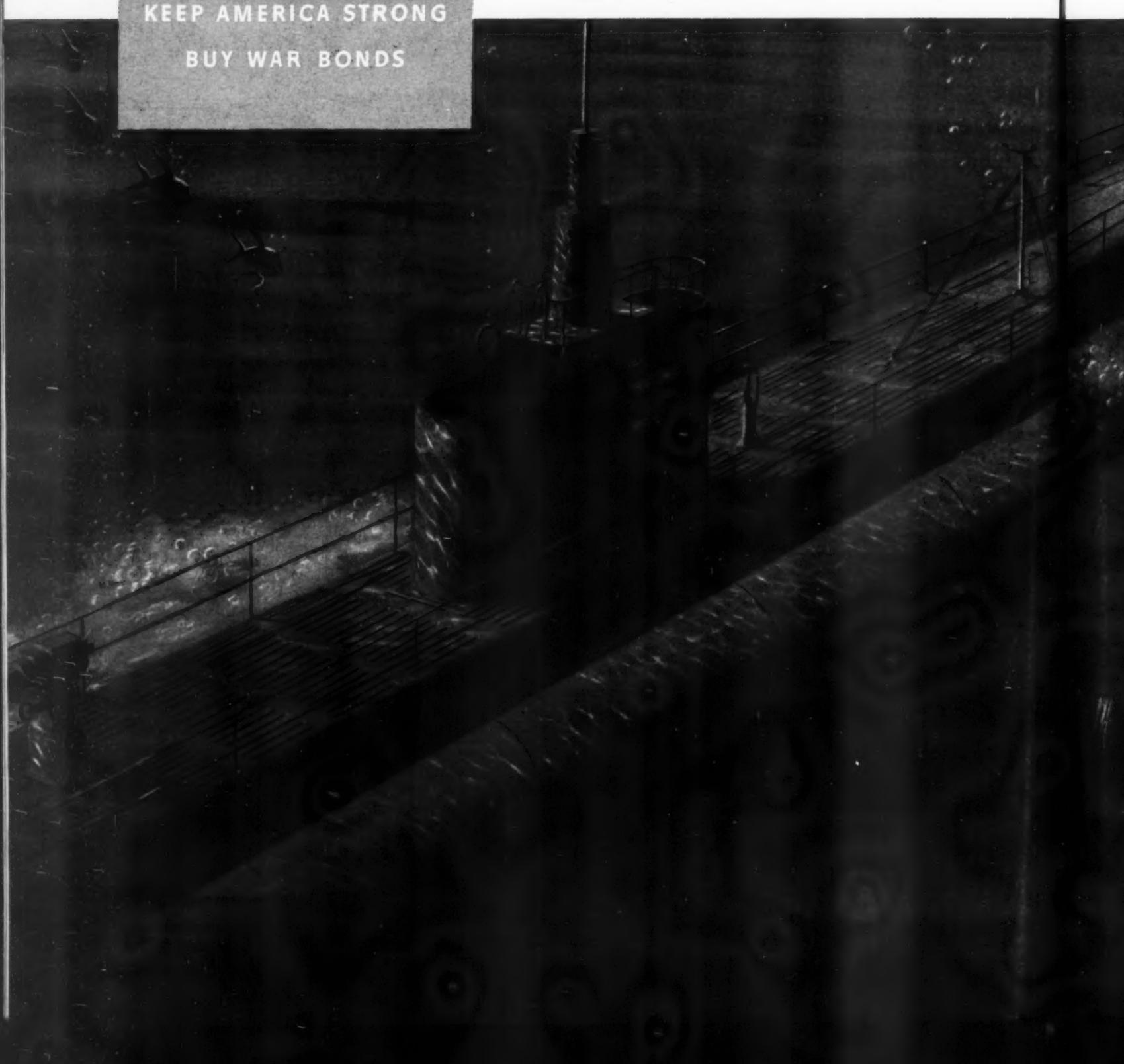
A 100-ton refinery tower moves out behind this Cummins Diesel-engined tractor.

Moving a light Army tank from rail terminal to secret destination.



Fighting Hearts for Sunday

KEEP AMERICA STRONG
BUY WAR BONDS

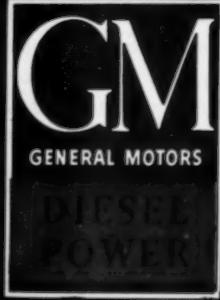




Sea Stingrays



Powered by
General Motors
Diesel-Electric
Drive



ENGINES...150 to 2000 H.P. CLEVELAND DIESEL ENGINE DIVISION, Cleveland 11, O.

ENGINES.....15 to 250 H.P. DETROIT DIESEL ENGINE DIVISION, Detroit 23, Mich.

LOCOMOTIVES..... ELECTRO-MOTIVE DIVISION, La Grange, Ill.

DIESEL "SUCKER-UPPER" IN BIG CLEANUP!

By F. HAL HIGGINS

EVER hear of Ladino? No? Well, it's an Italian white clover with a shame-faced habit of hanging its head to the ground. That makes it hard to harvest for seed, but those seeds are light, small and easily shattered out on to the ground. So, Ladino does a nice job of reseeding the land on which it is grown, but to get the precious seed harvested for sale is one of the toughest jobs in seed harvest to be found in the entire catalog of crops. And when we use that word precious, we are being very conservative in describing it. For the farmer is getting \$1.75 a pound for Ladino seed.

While the growers of soil-building seeds like the clovers, vetches, alfalfa, etc., have been having a great era under the Government's soil building programs the past decade, this newcomer, Ladino, has suddenly loomed on the horizon for its double value as live stock pasture and soil building. Its fame and adaptability to western soils has kept it rising in demand, so that seed prices have always remained high. They were less than half of this war price when your Old Reporter looked in on a farmer, who had worked out a system of harvest five or six years ago that would get the seed. This fellow was making money by buying more land to raise more Ladino and sheep. War has stepped up all farm prices the past four years. In fact, there was no recovery in ruinous farm prices until war opened late in 1939 and every commodity immediately jumped in price the day the news broke. With fertilizer materials scarce, soil-building seed that could put the nitrogen into the soil without man labor or materials needed by the war makers was in demand. That stepped up all these seeds in price to double what they were before war.

Up in Glenn county, on the West Side of the Sacramento Valley, where the great bonanza grain growers of the '70's and '80's grew wheat and barley on their ranches of 20,000 to 60,000 acres each, they have been starting to grow Ladino seed with war stepping up the trend. In a visit with the County Agricultural Commissioner, the writer looked into the Ladino seed industry to learn what was doing in this field.

"Well, I'll tell you what I've done this year by working mornings, evenings, Saturdays, Sundays and Holidays and using hired boy help I pick up around town," said Mr. Harrigan. "My boy has gone to the Navy now, you know, so I

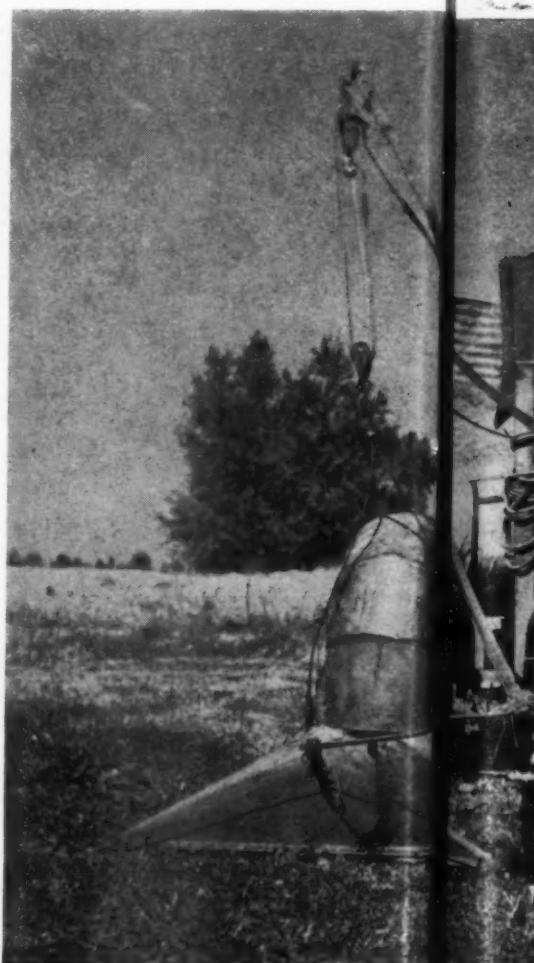
am all alone with this 40-acre farm I bought. This land is located right for Ladino, it seems, as we have a very low water rate of \$1, which is important. We get good yields of 200 to 300 pounds of seed per acre, we find, when we can get the seed all gathered up. That's the big problem—getting the seed. The seed is small, light and easily shattered as soon as it gets ripe enough for the Ladino heads to start drying brown. They not only naturally droop over to the ground, but get entwined among themselves.

Hence, to get a mower or combine to cut it to get all the heads is impossible. We get what we can and at every handling the shattering of seed increases until the best we can do is get a small portion of it. I find now after checking with neighbors, I have been leaving about \$300 per acre on the ground. What makes me certain of this is that a fellow named George Fiack out here in the country has built a vacuum cleaner machine on his Diesel tractor to clean the fields of Ladino seed on a 50-50 basis for those owners who agree to let him do this. He has simply cleaned up, getting \$100 to \$300 an acre in recovered seed that had been left after the owners had harvested their seed and got what they could the old way."

Knowing something about this seed game from watching it for some fifteen years, your Old Reporter decided it was worth going out to see machine and owner to get the story. So, the next morning he drove over to Glenn and up the river a few miles to the little farm of Mr. George Fiack. It was nearly noon, and Fiack and a Mexican worker soon appeared for lunch at the house. "Sure, come in and eat with us and I'll take you out to this machine and show you how it works if you will drive me back to my almond trees where we will work this afternoon." So that's the way it worked out.

Roughly speaking, the Sucker-Upper, as Mr. Fiack says the boys have named his Diesel field vacuum sweeper, is powered by an International tractor, which means it had lots of power to give the big fan hung on its rear plenty of suction. The writer took off his heavy desert helmet hat and held it under the mouth when it was running to find that it sucked this heavy piece up against the edges of the mouthpiece so hard it was an effort to get it loose. Just describe this outfit for DIESEL PROGRESS, we suggested to Mr. Fiack, as he climbed off the machine after demonstrating how he ran it.

"First," said Fiack, "the mounting of the ABC fan is a 3-point suspension with a caster wheel under it to support its rear as it extends back from the Diesel tractor. A smaller tractor wouldn't give me the pick-up power of this big fan. I tried smaller ones, and believe I would go on up to a still bigger Diesel if I decide to build a new machine next year. The fan is a 5-foot affair with 18-inch width. The vacuum opening, which resembles the contact piece on an ordinary vacuum sweeper for the home, is



The "sucker-upper" cost \$200 to \$300 an acre.

of 6-foot width. The trailer pulled by the Diesel tractor catches the material sucked up by the sweeper as the outfit travels down the field. Trailer is on rubber and takes very little power to pull. Note how the ground looks behind the Sucker-Upper? We get everything—loose seed, straw, trash, etc., and the stuff has loaded.

"Yes, it has encountered

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Side view of the machine mounted by its inventor George A. Fiack, who cleaned up some \$18,000 with it during September 1944.



The "sucker-upper" vacuuming a Ladino clover field to get \$200 to \$300 an acre after the regular harvest. The tractor is an International Diesel.

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down the
very little
and looks
everything-

loose seed, leaves, stones, etc. Naturally, the stuff has to be re-cleaned after the trailer is loaded.

"Yes, it has been the best paying thing I ever encountered. I built it to recover my barley

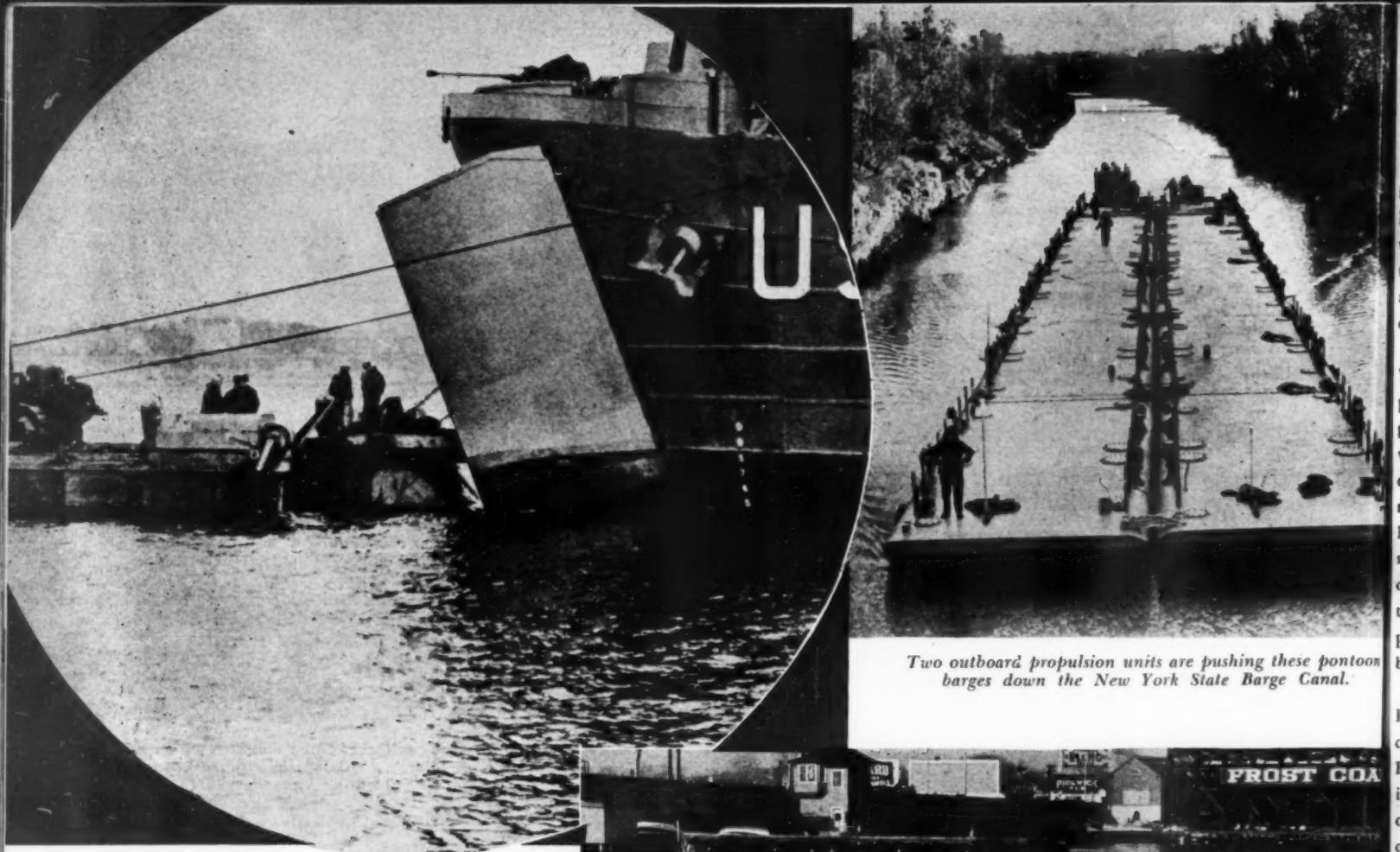
crop, which was shattered out and left on the ground after the north winds came along before harvest. It didn't work on that job, but when I tried it on this Ladino seed, I soon found I had something better than the gold in 'them thar hills.' But I went to my neighbors after

they had harvested their fields and told them I would take half and give them half of all the seed I recovered from their fields if they would let me clean the fields for them. Let's see, I cleaned up 21,000 pounds of seed in about thirty days work. I'll be all through with this kind of work for the year in another week or ten days. It's too windy to work at it today."

Your Old Reporter went away pondering this thing called "California machinery know-how" as he multiplied 21,000 by \$1.75 and came up with the conclusion that this fellow who had been smart enough to hook up a vacuum cleaner idea with a Diesel tractor had made himself a little cleanup of half of \$36,750, or \$18,375 for his 30 days work.

Maybe those old boys who waded around in the stream beds shoveling gravel into rockers and pans to get the stuff that shined a few miles from this scene earned more when they had lucky days, but they soon picked up all the easy money, so that today's gold diggers in the dry streams and gullies have to go deeper and deeper with costly dredging to find gold.

This Diesel vacuum sweeper that solved the farmer's seed harvest problem has solved a big if, that means more soil building seed for farmers everywhere while keeping the farm lands storing nitrogen and making them better for future crops.



D-Day in Normandy—Outboard-propelled "Rhino" ferry unloading an LST.

OUTBOARD UNITS IN DRAMA OF D-DAY

By WILL H. FULLERTON

IT WAS D-Day Eve. The brisk wind had increased with darkness until the English Channel was boiling with four foot waves as though it were angry at the huge, strange armada that was making its way toward the waiting enemy on the beaches of Normandy.

King Neptune must have scratched his head in bewilderment that night, for never had there been such a strange as well as large gathering of things afloat. There were ships of every type, every size, many of them awash as they fought the channel gale. Looking closely, the old man



Close-up of outboard units attached to a barge for trial runs.

of the sea must have been particularly puzzled to see the fleet of long, low pontoons, sometimes completely hidden by the raging sea; yes, he must have given up trying to solve man's ingenuity when he saw this fleet of power pontoons called "Rhino Ferries," ably making their way across the nastiest stretch of water in the mariner's book.

It was shortly after midnight on this fateful eve when one of the cumbersome appearing "Rhino Ferries" broke away from its destroyer tow, and began tossing wildly amid the oncoming war-

ships and transports. At this, even the Seabees, who had used the "Rhino Ferry" at Sicily, Anzio, Attu, and in the Southwest Pacific, shook their heads and drew a line through one available landing craft—it was too much to ask the "Rhino Ferry" to survive a channel storm. Battleships, cruisers, huge transports were having a tough time—what chance had the flat low series of pontoons, powered by two outboard motors?

But it would take more than a storm in the English Channel to stop this "Rhino Ferry" and

its valiant crew. Murray and his men with wave after wave crashing over them again and again, proved that the "Rhino Ferry" would stand up to the most difficult conditions.

Yes, that's what proved to the world that the "Rhino Ferry" would stand up to the most difficult conditions. It was the first time that the "Rhino Ferry" had been used in combat, and it had been a success.

It was specially invented for the "Rhino Ferry" and its units were commercial outboard propellers. The fact that they had undertaken such a dangerous task was a great achievement.

First of all, the propellers had to be made. After years of trial and error, the propellers were finally made. Then came the secrecy. They had to be kept secret to the allies so that the Germans would not know about them. Finally, the day of D-Day arrived, and the "Rhino Ferry" was put into action.

The lowly outboard propeller had come a long way since its days of secrecy. Now it was a proven fact that it could be used in combat.

Being powerful and quick, the outboard propeller quickly became a valuable asset to the Allies. There's no doubt that the "Rhino Ferry" played a major role in the success of D-Day.

They can be used in many ways, such as in fishing boats, small boats, and even in larger boats. They are also used in racing boats and in other types of boats.

its valiant Seabee crew. Starting up the two Murray & Tregurtha outboard propelling units, with waves smashing them as though trying to tear them from their bed, the "Ferry" was soon again under way to the beach-head under its own power!

Yes, that D-Day night, the Navy's Seabees proved to the world that the Murray & Tregurtha outboard propelling units could and would stand up under the most grueling of all obstacles, an English Channel storm. It is a matter of record that this particular "Rhino Ferry" was one of the first to reach its designated beach and, throughout the landing stage of the invasion, made many trips carrying essential trucks, tanks, and material from the transports and freighters to the fighting men on the beaches.

It was spectacular. Most acts of war are, especially invasion. But let's look at the "Rhino Ferry" and particularly the outboard propelling units with both eyes open to the future commercial uses. Let's look at these mammoth outboard units, aware that they will take terrific punishment and still deliver, conscious of the fact that they have played a most important role in nearly every invasion our forces have undertaken all over the world.

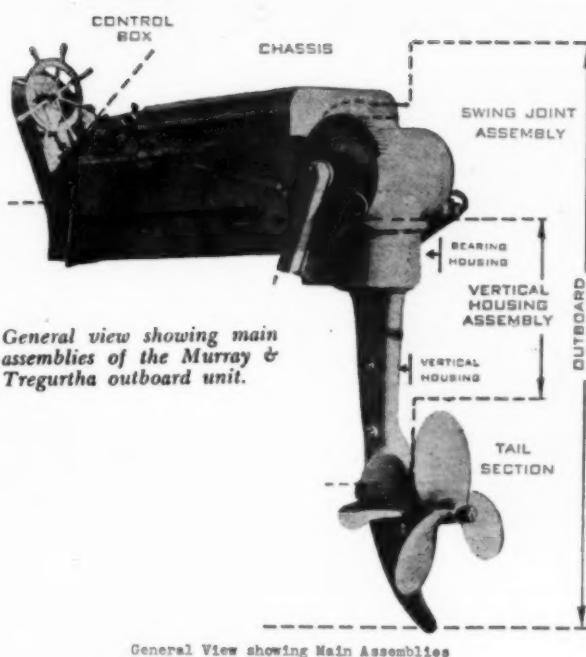
First of all, the Murray & Tregurtha outboard propelling units have been in use nearly four years, three of which were spent in absolute secrecy. The Navy knew they were the answer to the all-important question of getting material from ships at deepwater anchorage to the men fighting on the beaches. With D-Day in Europe, the veil was lifted. Here is what was revealed.

The lowly, unwieldy barge comes into its own—with the addition of one or two outboard propelling units, the barge becomes a powered vessel; self-reliant, self-propelled, and able to go anywhere, anytime!

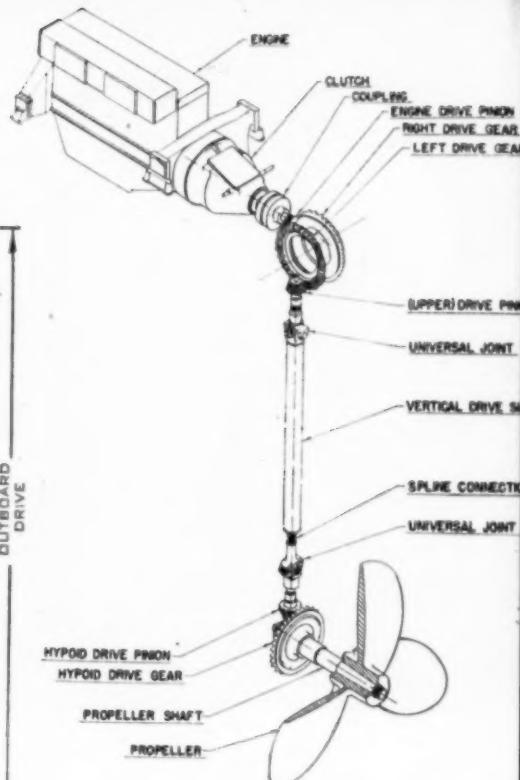
Being portable, these outboard units can be quickly transferred from one hull to another there's no loss of time or damaged hulls.

They can be used on any boat, barge, trawler, seiner, fishing smack, lighter, or tug whose stern is so built or can be altered, to allow the submersion of the vertical drive assembly into the water.

Shallow water is no barrier. Nor, will water filled with hidden submerged obstacles bar its way. The 180° elevating mechanism (which we



General view showing main assemblies of the Murray & Tregurtha outboard unit.



Drawing of the unit with essential drive elements identified.

will explain in detail later) takes care of that. At all times the one-man operator has complete steering control under full power, due to the 360° propeller steering control, an exclusive feature of all types and sizes of these outboard propelling units, whether Diesel or gasoline. The next time you see a laboring tug, inching forward with its awkward hawing tow of barges, picture if you will, each barge (yes, those squat hulks) going their own individual way, whenever and wherever the one-man operator wants. No, that's not a fantasy! As soon as the war is over and Murray & Tregurtha can devote its energies to peaceful trade, the self-propelled, maneuverable barge will become an actuality by the simple addition of one or more outboard propelling units, dependent on the size of the barge.

Now, just what does this mean to marine trade? Simply this. The barge will no longer be a helpless cargo-carrier. It will no longer be dependent for its every movement on the tug or towboat. The barge will be a powered vessel, able to pull away from the loading pier, deliver its cargo wherever you want—all independently! And, if so desired, a Murray & Tregurtha equipped barge can itself become the tug or towboat!

And more than all this—because of the 180° elevating mechanism, operated either by power or manually, and which elevates the entire submerged vertical assembly, outward and backward, your new maneuverable power barge can deliver or pick up cargoes in waters heretofore prohibited because of shallowness or underwater

obstacles. The 180° elevating mechanism allows the steering and propelling section to be angled so that you will have control and power while driving on over reefs and barriers which allow the hull to pass, but which would strike and ruin the stationary propelling and steering sections of any inboard power plant.

This exclusive feature has still another advantage. By means of the 180° elevating mechanism every part of the unit can be quickly and easily repaired and serviced. There is no need of dry-docking, entailing expense and loss of valuable time.

Think what this development means? Barges able to go anywhere, anytime! Fishermen able to reap harvests from beds and areas heretofore prohibited! Bayous, upper reaches of rivers and bays, lakes—towns that have been blocked from marine transportation because of the lack of channels—all are now open to commerce.

In talking with the Navy men who have operated these units under the most exacting tests ever given to any propulsion unit—invasion—they have a saying, "They'll get you in, and they'll get you out!"

By means of the 360° steering control the operator has full power control at all times, whether going forward or backward, because the propulsion and steering section can be turned a complete 360° cycle, or any degree desired. Here, for the first time in the commercial marine field, we have a super-maneuverability, which, at the same time assures safety and speed.



Above: Hal W. Harman, inventor of the "Vel-o-weld" process, looks over a damaged Diesel crankcase and miscellaneous damaged parts, foreground, in the Leland, Miss., power plant.

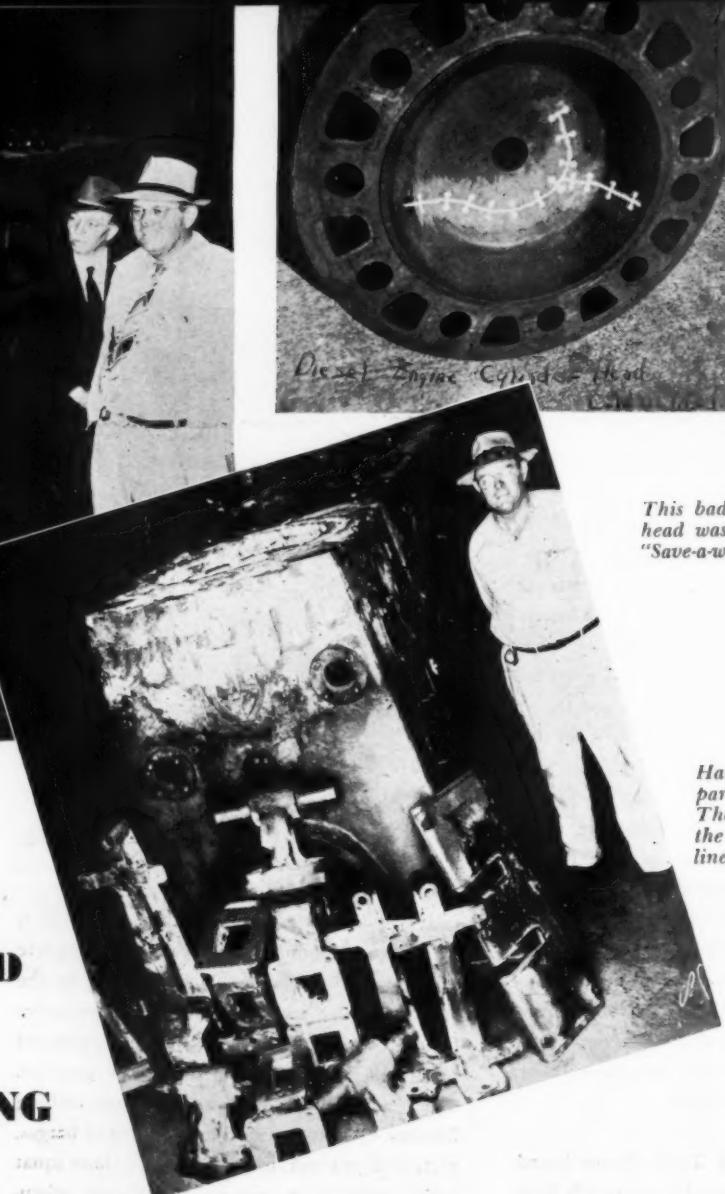
"REPAIRING AND SEALING" WITHOUT WELDING

NECESSITY is the mother of invention" is an old expression, but it was never more true than in the case of Hal W. Harman. Here is proof that not all the research nor all the developments and improvements in methods and processes come out of the large testing laboratories of the big companies. Nor are all those who find a way to do "the impossible" college educated. Several years of tireless trial and error, countless hours of study and scheming, resulted in the Harman "Save-A-Weld" process, sometimes known as "Cold Weld" although it is not a welding process at all but one of repairing and sealing without welding. And then later, still believing that there must be a scientifically correct way in which to weld iron castings without warping or setting up ruinous stresses, Hal Harman perfected the "Vel-o-Weld" process of welding iron castings that has permitted him to undertake and successfully complete hundreds of welding jobs that were either "too big" or "too tough" for the recognized "top-notch" welding firms in America.

Hal Harman, smilingly says: "There's no such thing as an easy job for us. Up until recently,

the only jobs I got were those on which others had failed or which others had refused to tackle. But, with 'Vel-o-Weld,' there's no iron casting repair job too big or too intricate for us to successfully weld."

Like most Americans, Harman had dreamed of some day owning his own business . . . any kind of business so long as it had to do with automobiles and engines. In 1925, he opened the first storage battery factory between Dallas and Los Angeles . . . the United Battery factory. He successfully operated this business until 1929 when he sold it to go into business with a large automotive supply firm as superintendent of machine shop and battery plant. Came the depression and again Hal Harman had to make a change. This time, he knew what he wanted to do permanently. He had found out what he could do better than anyone else in the southwest. He knew how to bore and machine and repair blocks of automobile, truck and tractor motors. So he set himself up in this business, with a portable unit, and almost immediately began to receive more work than he could handle.



Diesel Engine Cylinder Head



This badly cracked Diesel cylinder head was repaired by the Harman "Save-a-weld" process.

Harman inspects the repaired parts, shown upper left. These repairs were made on the job and involved 18 linear feet of "Vel-o-Weld."

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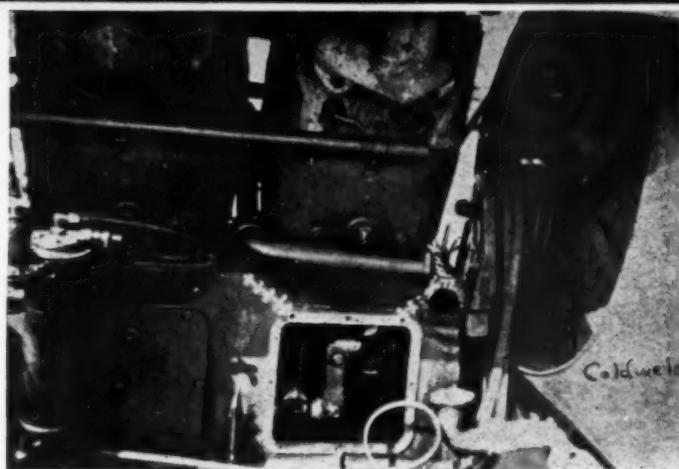
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Through these years of working on casting and motor parts of various types, Hal Harman saw the many futile efforts to properly weld cast iron. He saw the hundreds of engines which were repaired only to break down again soon after being put back into service. He saw the countless hours of machining and truing up necessary to re-align castings that were satisfactorily welded from a stress-relieving point of view. He could count the hundreds of jobs he lost because blocks and heads couldn't be properly repaired. He saw the urgent need for some repair process which could "save-a-weld," which could adequately restore a cracked or broken casting without the need of welding. In 1934 and 1935, machinery generally was in pretty bad condition, just as it is now. Then, it was because people either could not afford to have it repaired or couldn't afford to replace worn machinery. Today, the reason is because spare parts and adequate repair men are not available.

Hal Harman determined that he was going to do something about it. He believed there was a way to repair these cracked heads and blocks. He went to work on the problem and first per-



The cylinder
e Harman
inder wall crack in ring
vel area was repaired without
ching afterward.



The cracked frame of this small engine
was repaired by the Harman "Save-a-
Weld" process.

fected a metal seal of special alloys which sealed cracks cold. He patented this seal. This was the first Harman process. It worked all right on light castings where no mechanical stresses were set up. But it was not the complete cure of which he had dreamed. So he kept on working and experimenting. In 1935, he repaired the cracked cylinder head and block of a 6 cylinder White truck engine belonging to the McNutt Oil and Refining Company of El Paso. This engine ran six months on the hardest kind of service before Harman was paid for the job. When last heard from, this truck had been driven over 100,000 miles with the Harman repaired head and block giving perfect service. By 1936, he had perfected the patented "Save-a-Weld" process.

In 1937, he made his first repair on the broken head of a Diesel engine for the Duncan Utilities, Duncan, Arizona. He succeeded on this job after many others had failed—and the letter of tribute and recommendation written by A. Friedrichson, owner of that small Diesel plant in that little Arizona community, is one of Hal Harman's most cherished possessions.

As early as 1936, Hal Harman could see the bright future of the business which he had created. He saw the tremendous possibilities which his new methods of "cold-welding" had opened up for machine and repair shops or firms all over the land to do their own repairing of cracked or broken castings. Seeing the possibilities of salvaging millions of dollars worth of otherwise perfectly usable parts made of cast iron which could not be properly welded or otherwise permanently repaired, he decided to build an organization that could take his process from coast-to-coast and teach people how to use it. Benjamin F. Peterson, now Pacific Coast manager for the Harman Process Company, was one of the first men trained by Mr. Harman. For a number of years, Mr. Harman did not sell his material to the public, but licensed representatives to use the Harman process. This policy limited the rapid expansion

sion of the use of Harman locks. Now, however, the Harman Process Company's policy is to sell the material, to furnish detailed instructions for its use, and to encourage machine and repair shops and firms to have their own mechanics do their repairing of cracked or broken castings with the "Save-a-Weld" process.

With the experience on thousands of satisfactory repair jobs made over a large part of the country by his crews, Hal Harman came to realize that the "Save-a-Weld" process, though ideal for a vast range of uses and the most economical and speedy repair on the average job—it, alone, still did not completely solve the problem of properly salvaging very badly cracked or completely wrecked castings often of large sizes. Harman believed that he could actually weld some of these jobs cheaper, better, quicker than they could be repaired by the "Save-a-Weld" process. But he also fully recognized the all-but-insurmountable obstacles to conventional welding jobs of these. So he set out to devise a practical, foolproof method of welding iron castings of any size or complexity, regardless of how badly cracked or broken they were. From 1938 to 1941, he spent countless hours working with various fluxes and metals and methods of welding castings that would be stress-free without the necessity of pre-heating, which almost invariably results in distortion. Out of this experimentation, but more particularly out of his years of experience with repairing and welding and handling engine blocks, heads, valves and other cast parts, came the revolutionary, but now completely proven and recognized "Vel-o-Weld" process.

In February of 1942, shortly after Pearl Harbor, Hal Harman was ready to meet the challenge of war with both the "Save-a-Weld" and "Vel-o-Weld" processes. Hal W. Harman put his crews and his processes at the disposal of the government. And Uncle Sam was mighty glad to get them, too. An article about Harman which appeared in a last year's issue of Liberty Magazine under the heading of "Hurry-Up Harman"

said that "with the coming of war, Harman and his crew put on big league boots"—and that they did. They went to work in earnest for the Navy and for many war industries. Harman's first "Vel-o-Weld" job for the Navy was completed in June of 1942, and since then he has done many more jobs for the Navy and in other military installations. The Navy has been using the "Save-a-Weld" process since 1939.

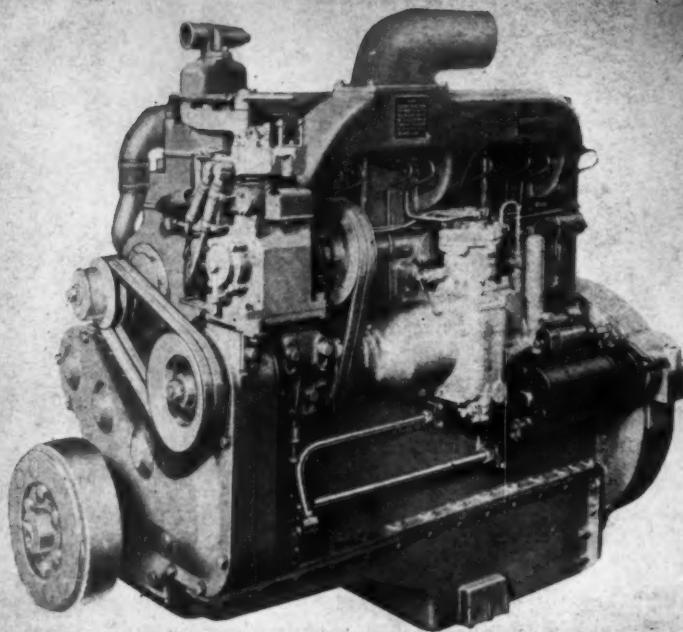
Harman offered to set up schools and teach Navy repair personnel how to use his process. His offer was accepted and he has helped train Navy men who have made repairs with the "Save-a-Weld" process all around the world, saving millions of dollars and countless hours.

During the war years, the urgent needs for the Harman processes have increased tremendously. Harman realized that he should sell his "Save-a-Weld" lock material and should issue simple, easily understood instructions which anyone with average ability to use hand tools could follow. This has proven to be a wise move, as enough trained Harman crews were not available to answer all of the many calls.

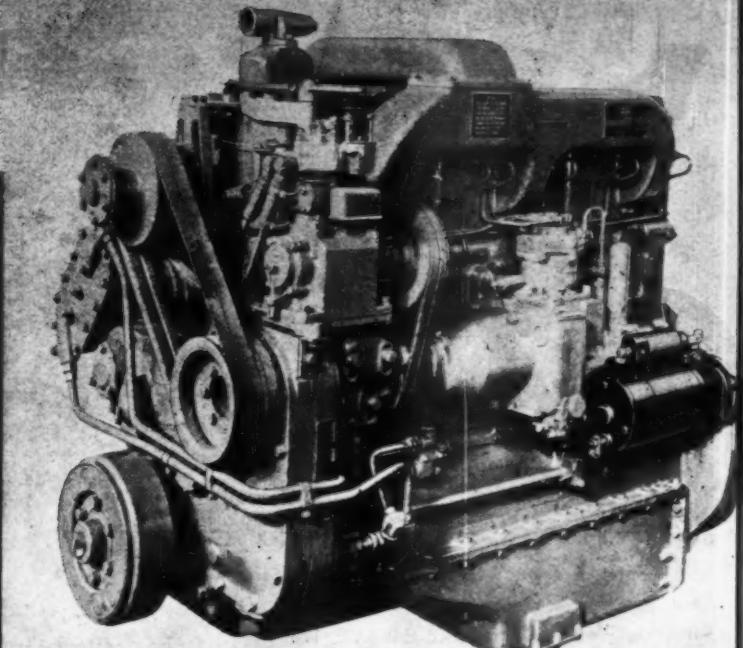
Since the "Vel-o-Weld" is a secret and patented process, and one that can be used successfully only by Harman trained men, "Vel-o-Welding" is only done by Harman crews on contract jobs. Because of experience and knowledge gained, Harman crews are doing jobs easier and faster than before, and are now available for more jobs than heretofore.

The "Vel-o-Weld" process of welding cast iron has been successfully used by Harman crews for the U. S. Navy, steel mills, copper smelters, mining company, oil and gas pipe line companies, oil refineries, a large number of public utilities, railroads, bus and truck operators, the U. S. Maritime Commission, laundries, paper mills and numerous other industrial plants. Harman "Vel-o-Weld" process and Harman "Save-a-Weld" material have been used to repair engine heads, cylinders, blocks, frames, piston and liners on Diesels ranging in size from 50 to 6,000 horsepower. A partial list of the Diesel operators using the Harman processes includes the names of well-known concerns scattered across this continent.

Though his recognition has spread from coast to coast, and although he is often called in to do vital and urgently needed repair work where all others have failed, Hal Harman is the same, modest, slow-speaking but fast-working Texas cowpuncher that he always was.



The automotive version of the Series NHS-600 (supercharged) Cummins Diesel.



Pictured is the automotive version of the Series NH-600 Cummins Diesel.

CUMMINS REVEALS NEW DEVELOPMENTS IN HIGH SPEED DIESELS

FOllowing by 13 years the introduction of the Model H, which has been operated successfully in heavy-duty automotive, industrial and marine service, Cummins Engine Company, Inc., now announces the development of a new series of engines which continues the Cummins trend toward "more power per pound through high speed Diesels."

"New," perhaps, is not the word to describe the Series NH-600 and NHS-600 Cummins Dependable Diesels, because they are, in reality, merely higher speed and higher horsepower versions of the familiar Model H and its supercharged counterpart, the Model HS. The increased output of these newly developed six-cylinder engines is obtained by these three major innovations in established Cummins design: (1) By increasing the maximum operating speed from 1800 rpm. (Models H and HS) to 2100 rpm. (Series NH and NHS). (2) By increasing bore and stroke from $4\frac{1}{8}$ in. x 6 in. (Models H and HS) to $5\frac{1}{8}$ in. x 6 in. (Series NH and NHS), which increases piston displacement from 672 to 743 cubic inches. (3) Dual intake valves are employed to provide the increased air supply needed to assure efficient combustion of the additional fuel which the engine requires in order to produce increased horsepower. Dual exhaust valves permit the rapid exhausting of gases from the firing chamber.

Comparing the 200 hp. maximum output of the NH engine with the 150 hp. of the parent

Model H, it can be seen that these improvements in design have produced 33-1/3 per cent additional horsepower without appreciably increasing engine weight or dimensions. An even greater gain in horsepower (37-1/2 per cent) is revealed by a comparison of the supercharged NHS engine with the supercharged Model HS, with 275 and 200 maximum horsepower output, respectively. Here, too, the increase has been obtained at little cost in weight or size.

In most respects other than those listed above, this new series of Cummins Diesels bears a marked resemblance to the H line. Basic design and construction are the same. Overall dimensions of the block remain unchanged. A high percentage of parts, including crankshaft, connecting rods, main and connecting rod bearings and many more can be used interchangeably in either series of engines.

They also employ the same four-stroke cycle principle of operation; the same exclusive Cummins Fuel Distribution and Injection System; and many of the same accessories. Important, too, from the standpoint of maintenance, the easy accessibility of parts which is provided in the Model H, is also provided in the newer line.

Limited numbers of Series NH and NHS Cummins Diesels have already been placed in service. Most of them have been installed in new 20- and 30-ton dump trucks manufactured by Euclid and Mack, which are working on the

Iron Range and on various other open pit mining jobs both in this country and Canada. Although the performance data obtained thus far from these operations is limited, there is every indication that these engines are living up to all expectations. This is evident in the statement of one operator on the Iron Range who reports 33 round trips per eight-hour shift with trucks powered by the new NHS engine, as against 22 round trips per shift for trucks powered by the old Model H engines.

According to company officials, quantity production of Series NH and NHS Cummins Diesels is anticipated by the middle of 1945, although these plans are subject to whatever changes may be decreed by developments in the war. They will be manufactured in a complete line of automotive, industrial and marine models, but for the first few months, at least, the production emphasis will be placed on automotive models and power units of various types which are urgently needed for high priority jobs. Marine engines and generating sets will follow just as soon as conditions permit, probably in the third quarter of 1945 if present schedules can be maintained.

In announcing the development of these new additions to the Cummins line, the company makes it clear that manufacture of all existing models will be continued. These include, in addition to the H and HS, both medium and high speed models for automotive, marine and industrial service.

this breather

KEEPS OIL IN ITS PLACE

...another example of Air-Maze engineering

In ventilating crankcases and gearcases in engines, compressors, and other machines, oil can be lost by becoming entrained in air. Preventing this loss eliminates excessive oil consumption, nuisance and hazards. So for this purpose Air-Maze provides a line of breathers incorporating an oil-separating feature that returns the oil to the crankcase or housing.

You may never require a breather, but you can have engineered filtration in every Air-Maze filter. Whether your interest in filters applies to air conditioning, ventilating, compressors, blowers or engines, remember—"if it uses air, use AIR-MAZE".

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IF IT USES AIR...USE
AIR-MAZE
ENGINEERED AIR FILTRATION

TWO NEW BRITISH DIESELS

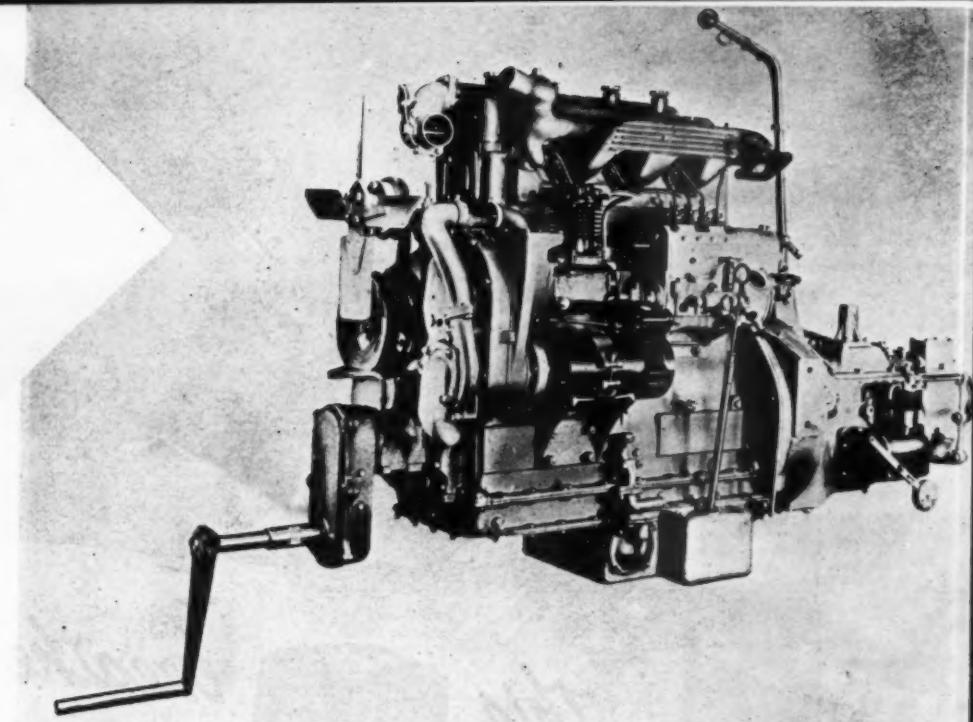
Courtesy Modern Transport

TWO new Diesel engines, the four-cylinder DC4/2 (improved version of an existing model) and the six-cylinder NR/6, an entirely new design, are now being manufactured by John I. Thornycroft and Co. Limited. Both units are of the direct injection type, so designed that swirl in the combustion chamber is set up during the induction process and the use of specially shaped air-ports eliminates the need for masked inlet valves.

The four-cylinder DC4/2 has been designed as an alternative unit for the types of chassis equipped with the AC4/1 petrol engine and can be dropped into position without any alteration to the existing mountings. Rated at 27.23 hp. (R.A.C.), this unit has a bore of 4½ in. and 6 in. stroke, giving a cubic capacity of 5.25 litres. It develops 61 bhp. at the maximum governed speed of 1,700 rpm. the maximum torque being 223 lb./ft. The main monobloc casting comprises the four cylinders, and the upper portion of the crankcase is of the deep skirt type which extends well below the crankshaft center line, making a very rigid support for crankshaft. The cylinder bores are renewable wet liners fitted with joints at their lower ends, the cylinder block being machined to receive the ground liners, which are then honed with liners in place.

The crankshaft, which is balanced statically and dynamically, is supported in five steel-backed white metal bearings; the main journals are of 3½ in. diameter. These proportions are generous, having been adopted to ensure great longevity for the bearings. For the big ends, the crank pins are of 3 in. diameter, and the upper halves of the connecting rod bearings are lined with lead bronze with white metal for the caps.

The pistons of aluminum alloy have hemispherically recessed crowns of patented design and have three compression rings and one oil control ring above the floating gudgeon pins,



The new Thornycroft, 4-cylinder, automotive type Diesel engine.

with an additional oil control ring at the bottom of the skirt. Supported by three bearings in the crankcase, the camshaft is driven by a twin roller chain from the front end of the crankshaft, operating the overhead valves through mushroom tappets, push rods and adjustable rockers, the tension of the chain being maintained by an automatic adjuster.

Cooling is by a centrifugal pump mounted in front of the timing case and driven in tandem with the dynamo. Special attention has been paid to the water jacket proportions in the cylinder head and the direction of the water flow to the valves and injector seats. Mounted above the dynamo is the shaft which drives the exhauster and the fuel pump, all the auxiliaries except the starter being located on the nearside.

The one-piece cylinder head contains the vertically disposed valves, each atomizer being placed centrally between the valves on the center line of the bores, and injection is controlled by a C.A.V. or Simms pump. Pressure lubrication supplies all the engine bearings, but the gudgeon pins and cylinder bores are fed by splash.

Both engines have a 16 to 1 compression ratio. Provision is made for fitting cold starting equipment on engines intended for use in abnormally cold climates, for which purpose a Zenith Ether starting carburetor is adopted. Starting is satisfactory down to temperatures of minus 40 deg. F. The engine is arranged for three-point suspension by means of a forward bracket and two arms formed on the fly-wheel bell housing

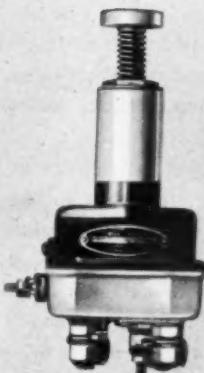
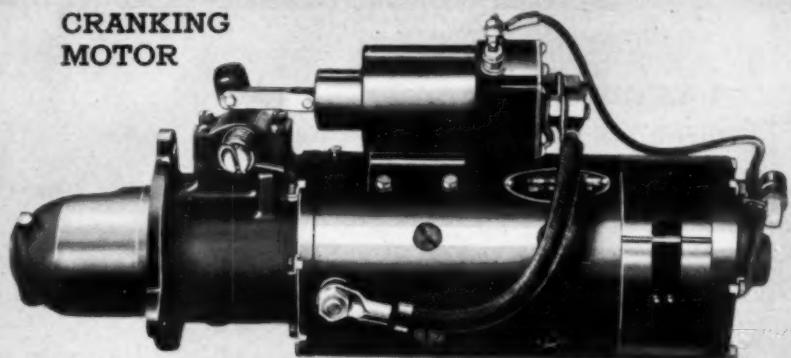
bolted to the rear face of the cylinder casting.

The new Thornycroft NR/6 six-cylinder direct-injection Diesel engine has a monobloc cylinder crankcase casting fitted with renewal dry liners instead of the wet liners used for the DC4/2 engine. Rated at 40.8 hp. (R.A.C.), it has a capacity of 7.88 litres and develops 105 bhp. at the maximum governed speed of 1,800 rpm., the maximum torque being 348 lb./ft. When set for best road performance the fuel consumption is approximately 0.360 pints per brake-horse-power-hour. The bore and stroke are 4½ in. and 6 in. respectively. The NR/6 engine can be fitted in chassis as alternative unit to the petrol AC6/1 unit.

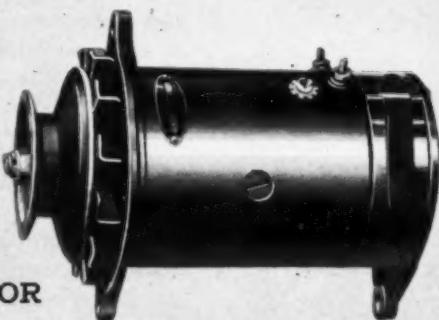
Having the same generous journal dimensions as the four-cylinder unit, the six-cylinder crankshaft is supported in a deep skirt by seven main bearings with thrust flanges for the center shells. The cylinder heads are in two castings, each for three cylinders, and are interchangeable. The camshaft is of the five-bearing type, but otherwise the valve mechanism is similar to that already described for the DC4/2.

The lubrication system has an oil capacity of 5 gal. and the normal oil pressure is between 40 and 50 lb. per sq. in., which is somewhat higher than that of the four-cylinder unit. The arrangement for the filtering of the lubricating oil has been modified and the supply to the main and connecting rod bearings improved. In bench tests, at 1,800 rpm. a power output of 105.3 bhp. has been produced.

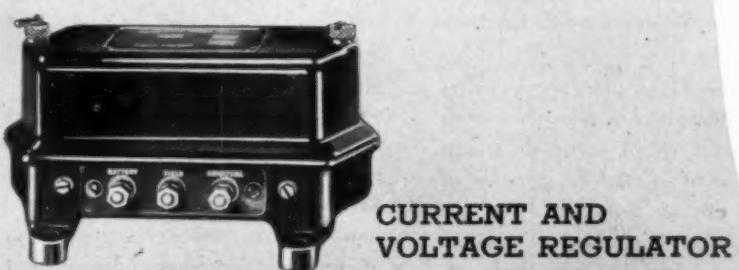
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DELCO-REMY Diesel Electrical Equipment

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Delco-Remy has been an important factor in the Diesel industry since its earliest days. Gearing its research and development to the industry's needs, Delco-Remy has developed cranking motors, generators, regulators and switches that have helped to set the pace for the rapid growth of Diesel power. Borrowing on its long experience in the automotive field, Delco-Remy has long made the industry's problems its problems. Delco-Remy is at the service of the Diesel industry in all its wartime and peacetime requirements.

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BUY MORE WAR BONDS*

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BUILDER OF AUTOMOTIVE, AVIATION, TRACTOR AND MARINE ELECTRICAL EQUIPMENT

SUPERVISING & OPERATING ENGINEERS' SECTION

"SPECIALIZED LUBRICATION"

Part 2

Conducted by R. L. GREGORY *

CONTINUING the discussion on the above subject, which was started in the last issue of Diesel Progress, the writer would like to be a little more specific on some of the "whys and wherefores" of this type of lubrication. The discussion of this subject was prompted by the receipt of a letter several weeks ago, from a Diesel Engineer in a far Western plant. Let me quote a paragraph from this letter.

"I have operated Diesel units for many years and am what is probably known as old fashioned. I do not believe in all these ideas promoted by the modern engineers, that I must have a different type of oil for each part of my units, and consequently have used one grade of good oil in all my lubrication, engines and auxiliaries alike. However we decided a few weeks ago to change the bearings in one of our old units, as they had become pretty well worn due to all the years of operation. We got the new bearings and installed them, and immediately we began to have trouble with wiped bearings. After renewing three of these, I changed to a different brand of oil which was recommended to me. Since then I have had no further trouble, but I am still wondering why my old reliable lubricant didn't take care of these new bearings. We have always kept our oil in good condition and the crank case clean, as well as the oiling system."

Well let us analyze this statement. Evidently this Engineer was one of the old hard shell boys who believed in the saying "What was good enough for father is good enough for me," and while that statement might be entirely true as referred to some matters, it hardly will apply to modern power plant practice. We are a nation of progressives so to speak, and progress can only be obtained by a constant striving to better design and efficiency of our equipment. With that in mind, let us concentrate on this matter of bearings. There has been an earnest effort on the part of bearing designers to make better bearings and use better metals in the manufacture of such bear-

* Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.

ings. As stated in the previous article, such progress means a reaching out into other fields, the lubricating field being one of the important ones.

Whenever an improvement is made in machinery design, it presents new problems of lubrication. Units as manufactured years ago were constructed of a few well known metals, and only a few. Units today have parts, all of which are constructed of metals that a couple of decades ago were unknown. This is true of bearings. With this entry into the field of many new alloys, since no one metal contains all the desired qualities for bearing construction, the oil industry too was forced to blend various types of lubricants, to satisfactorily lubricate these new metals. No one grade would still do a satisfactory job.

In the above case, this engineer was what the writer might term "lucky." He had an oil which gave satisfactory results on the lubrication of the unit as designed at that time. Perhaps had the tolerances been closer on his bearings, he might not have been so "lucky", that is a matter of opinion. But when he got his new bearings, in all probability they were composed of later developed metals, consequently his old type of oil was not satisfactory and his trouble was only eliminated when he adopted an oil suitable to the metals involved.

In the design of bearings, the designer strives to acquire a combination of alloys or metals most suitable to the type of service, the strains and stresses involved in efficient operation of those bearings. By so doing, he forces the lubricating engineers to develop a lubricant composed and compounded of ingredients suitable for proper lubrication of those bearings.

This does not apply to bearings alone. Take the lubricant involved in liner lubrication. Many various types of metal are used in liners, pistons and rings and in the liners themselves. Some are developed of softer metals, others of varying grades of hardness. With each different type a different type of lubri-

cant must be used. Otherwise one will run into difficulties. Both manufacturers of Diesels, as well as the compounders of lubricants, have spent many thousands of dollars on the study of metals and lubricants, both striving to give the trade the best product possible to maintain their engines at highest operating efficiency.

In the compounding of lubricating oils many things are involved. Heat plays an important factor in selecting the proper lubricant. Most oils are composed of hydrocarbons and these react to heat or temperature and oxidization in varying degrees. Some will produce a high content of carbon, the sort that is brittle and coarse, while others subjected to the same conditions will remain soft, fluffy or even assume a gummy stage. The former is to be avoided, since any lubricant which results in a carbon of gritty and brittle nature when used, also has a tendency to cause ring sticking and clog ports.

The writer recently received another letter from an engineer in the midwest saying that one of his units was giving a great deal of trouble with rings breaking. Upon investigation he had found that the nature of the fuel oil he had been burning had changed considerably within the last few months, and that the fuel he was now getting had a higher fire point than his old fuel, to which he felt the ring breakage was partially due also corrosion of the fuel injection valves, and that he was taking steps to correct the situation. A condition of this type might lead to the development of more carbon, but in any case it would have some effect upon the quality of lubrication obtained. Whenever there is an excess of ring breakage, lubrication must be diligently watched, for if the lubricant deteriorates or is hampered by blowby and excessive heat, there is a possibility of scoring of the piston and liner.

"Specialized Lubrication" is a must, and if engineers expect to get efficient operating results and keep their maintenance at a minimum, they must adopt it.

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The "E. Lester Jones," one of the sister Diesel ships in the Alaskan and Aleutian fleet of the Coast and Geodetic Survey.

COAST AND GEODETIC DIESEL SURVEY VESSELS

STANGE waters do not deter invasions by the armed forces of the United States. The Coast and Geodetic Survey sees to that. A branch of the Department of Commerce and a peace-time aid to shipping, the Survey is now working closely with the Navy to chart invasion waters. It knows its reefs and tides better than an old-time taxi driver knows his city's streets and alleys.

The fighting was going on not far away when a Survey party made maps and charts in the Aleutians. This happened a few hours after the Army and Navy had landed men in Holtz Bay during the invasion of Attu. Soundings were made and hidden reefs were found in Massacre Bay and complete maps and charts were handed over to the fighting forces within a week after the party started to work.

Hardy men in sturdy ships weather the terrific Williwaws, prowl around strange reefs, make landings in small boats through pounding surf and lead a hazardous life in general to get the data for Coast and Geodetic Survey charts and facts. More than excellent seamanship and a stomach for danger is required from the Survey men. They must be scientists as well, in order

to map the tides, winds and ocean bottoms. The entire Alaska and Aleutian coastline is surveyed by a fleet of five small vessels. It was this fleet that did the remarkable survey job in the Aleutians. Two ships in the fleet have attracted especial attention because they are sister ships and because of their small size for operations in such violent waters. The *Patton* and the *E. Lester Jones* are the names.

The *Patton* and *Jones* are 88 feet long and are powered by twin 150-horsepower Cooper-Bessemer Diesel engines. They are of wood construction, 21-foot molded beam and approximately 8-foot mean draft. Accommodations are for 3 officers and 12 men. Crew's quarters are forward with galley and crew's mess on the main deck. Wardroom is aft with its own toilet and shower compartment. Living quarters, engine room and pilot house all are accessible without going on deck.

These statistics provide a background for imagining what it is like in a Survey ship when a storm with the force of a hurricane and the twisting motion of a tornado strikes with the suddenness of lightning, as the Williwaws do in the Aleutians. Then, the men creep around

on hands and knees; steering is difficult; storm and currents mix in a fury that tosses a little ship like the *Patton* or *Jones* around like a cork. But these sturdy work vessels with their powerful and faithful Cooper-Bessemer Diesels ride out the storm to go about their next task, perhaps to plunge through the tide rips of a passage between islands.

Vessels similar to these operate in other invasion waters. A survey crew assists in all survey operations. The *Patton* and *Jones*, for example, carry wire drag gear, echo sounding machines, radio for communications and to give the ship its position within a few yards. Modern equipment permits a sounding more than three miles deep in 7 seconds (it used to take 4 hours), while the ship is travelling at full speed. A sound signal which bounces back up is the secret. The time of the sound signal's travel reveals the depth.

It is the work these crews have been doing for 128 years, the Coast and Geodetic Survey being established in 1816, that makes the Washington headquarters the source of information on time and tides, weather conditions, best channels and other data pertinent to invasion plans.

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Exchange Your Diesel Maintenance Ideas

Conducted by R. L. GREGORY

Editor's Note: In this department we provide a meeting place where Diesel and Gas engine operators may exchange mutually helpful maintenance experiences to keep our engines in top condition. Mr. Gregory edits your material and adds constructive suggestions from his own wide experience. This is your department—mail your contributions direct to DIESEL PROGRESS.

Is Anything Wrong With This Idea?

MOST of the material appearing in this section is devoted to maintenance of the larger slow speed units used in Power plants, and other industrial uses. However there are many readers among the operators of small high speed units used for automotive power, tractors, and such types of work who also have problems and are interested in the various suggestions and comments made in this section. We recently received a letter containing the following article from one of our readers, a man who has spent several years operating various types of these smaller high speed units. He has requested that we present the following to our readers, for their comments and criticisms.

"Although the exhaust is seldom very clean, and the fuel consumption never as low as can be obtained in the open type combustion chamber, the low peak pressure, processing of fuel, and the fact that they do not require precise timing of injection, all point to and seem to justify the assumption, that pre-combustion features will maintain a prominent place in the development of small bore, high speed Diesel units. In the following explanation of my idea, since only a small amount of fuel is consumed in the pre-combustion chamber, I will refer to it as the injection chamber, and use the term two stage injection.

Referring to Figure 1, which is illustrative of the open type of combustion chamber, if we are to take advantage of the processing of the fuel that can take place in the injection chamber, the primary injection of fuel should have an advance of 15 to 20 degrees and be completed (under normal load) by the time the piston has reached top dead center. The fuel will ignite about 10 degrees before dead center is reached, the pressure will rise to approxi-

mately 700 pounds, and secondary injection will begin.

During the time when the volume is constant, the pressure in the injection chamber and the cylinder will equalize, and further injection can only take place as the pressure in the cylinder falls due to the downward travel of the piston. The piston travels down on the expansion stroke and ignition continues throughout the entire stroke. If the exhaust valve opens against a gauge pressure of approximately 20 pounds, a substantial amount of fuel will be in the injection chamber, 43 percent of which will be carried into the next cycle, while 57 percent will pass out through the exhaust. Probably 50 percent of the fuel will burn under ideal conditions, but that injected late will mix with the inert gases, which percentage will be high and little power will result therefrom.

Now referring to Figure 2, descriptive of a two stage injection chamber. Suppose we divide the injection chamber into two compartments, namely "A" and "B," making compartment "B" somewhat larger than compartment "A," and using a compression ratio of 16 to 1, as the piston moves up to dead center. If it moves 1/15 of the stroke in the downward position, the clearance volume will be doubled. If the air in chamber "B" is expanded to twice its volume, it will displace the air in chamber "A" because "B" is larger. If Chamber "A" were filled with fuel, the secondary injection would be completed before the pressure in the cylinder had dropped to 300 pounds.

The injection Chamber will now act as an air storage and spray air into the fuel charge through the remainder of the stroke. If the secondary injection were completed in a reasonable length of time, there would seem to be no reason why the combustion would not be as good or better than in a unit using the open type chamber as illustrated in Figure 1.

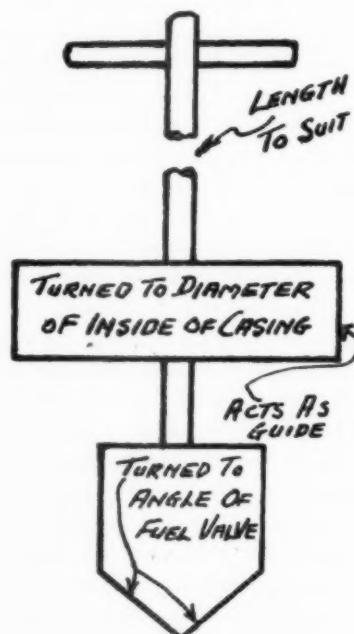
When the explosion takes place in Chamber "A," the fuel will of course cushion back against the air in Chamber "B." Too much mixing at this point would be undesirable

since we want a quantity of clean air to scavenge chamber "A." To discourage over mixing, it would be necessary to partition off chamber "B" with vertical fins, extending from the bottom of chamber "B" to a point represented by the line c-d. These would be placed equidistant around chamber "B" as shown in Figure 3. These fins or partitions would also furnish a path for the transfer of heat from the walls of the chamber. To my way of thinking this would be an advantage over the conventional open type chamber."

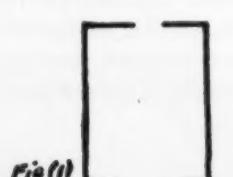
The above idea has been advanced by Mr. F. Galloway of Reading, Michigan, an experienced operator of high speed small bore Diesel units, and he would appreciate our reader's comments on this idea.

Reconditioning Fuel Injection Valves

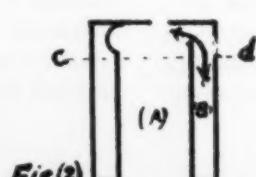
Unless properly equipped the reconditioning of fuel injection valves (on air injection engines) sometimes becomes quite a problem, depending of course upon the condition in which one finds them upon inspection. The following submitted by Mr. C. Jennings may be of help to some of our readers.



"Illustrated herewith is a tool which I have made up for use in reconditioning the fuel in... And now please turn to page 84 ...



OPEN TYPE



SUGGESTED
2-STAGE TYPE



SHOWING
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OF STAGE B

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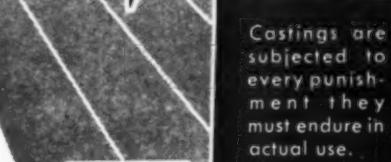
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In this "court"—N-B-M's modern research laboratories—bronze parts must endure the most critical cross-examinations and tortures unmerciful engineers can devise.



The judgment of this jury is stern. Only castings that acquit themselves completely under rigid metallurgical and manufacturing controls are worthy to be ...

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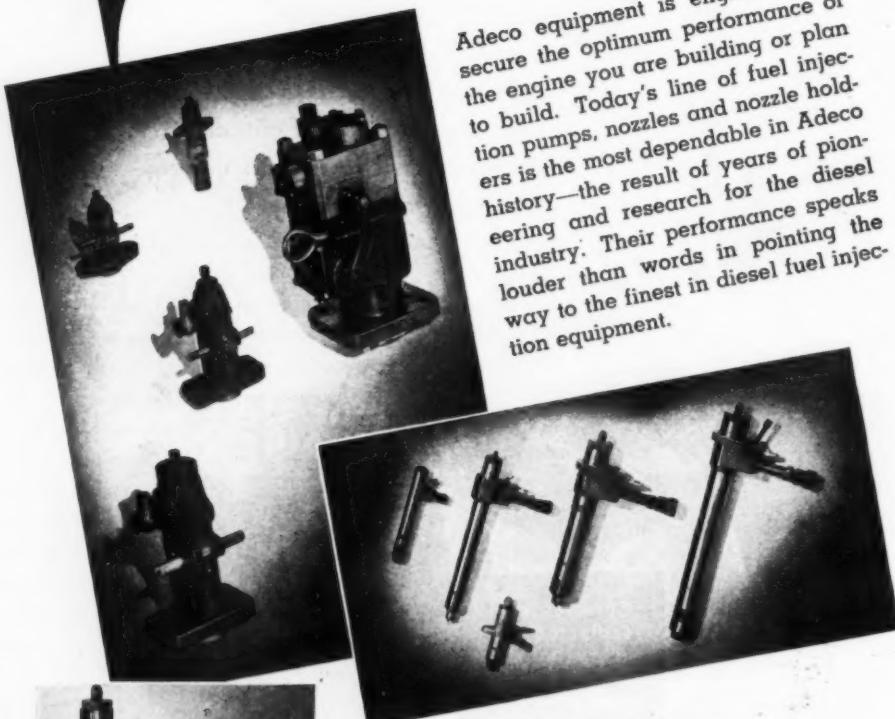
ST. LOUIS • NEW YORK

Brake Shoe



SAFE GUARD DIESEL ENGINE PERFORMANCE with Dependable ADECO FUEL INJECTION EQUIPMENT

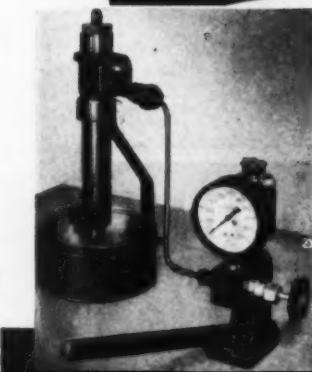
Adeco equipment is engineered to secure the optimum performance of the engine you are building or plan to build. Today's line of fuel injection pumps, nozzles and nozzle holders is the most dependable in Adeco history—the result of years of pioneering and research for the diesel industry. Their performance speaks louder than words in pointing the way to the finest in diesel fuel injection equipment.



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America's most widely used Nozzle Tester enables any mechanic to make quick, accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Compact, portable, sturdy, precision-built. Pressures up to 10,000 p.s.i. Tests both large and small injectors. Avoids costly delays and possible damage to engine. Also obtainable with Navy-approved gauge. Write for bulletin.

Ideal for Testing Hydraulic Equipment



AIRCRAFT & DIESEL EQUIPMENT CORPORATION

4401 RAVENSWOOD AVENUE, CHICAGO 40, ILLINOIS

Exchange Maintenance Ideas

Continued from page 82

jection valves on our air injection engines. It is of the same size and shape as a regular reamer and with the use of grinding compound one can clean up the bottom of the atomizer casting, with atomizer and bushing removed of course. This idea may not be entirely new, although I have not heard of it being used before, and it really is a handy tool when a reamer is not available."

Ideas such as the above are all helpful to the maintenance man or operator who is handy with tools and who has not the available reamer which is used in such work. Reamers of this nature are expensive equipment but are a warranted need when one has enough equipment to warrant the spending of money to facilitate quick repairs or numerous repairs. There are any number of such tools that can be made cheaply at times when repair work is slack and time available to construct them.

Hendy Announces Diesel Sales Unit

G. C. (JERRY) RASEY has been named supervisor of the marine and stationary Diesel division of the general sales department at the Joshua Hendy Iron Works, Sunnyvale, Calif., with Lawrence H. Earle and Louis Kaiser.

Before joining the Hendy organization, Rasey was west coast representative of the Murphy Diesel Company, Milwaukee, Wisconsin. Prior to that, he was sales manager for the Washington Iron Works, Seattle, Wash.; development and sales engineer for the Hercules Motors Corporation, Canton, O.; and chief power engineer for the Bucyrus-Erie Company, Milwaukee.

Earle was previously with the Diesel division of the National Supply Company, at the Philadelphia plant of which he was successively sales manager, head of the service department, advertising manager, and assistant plant manager. Before that he spent 15 years as eastern sales and service manager for the Buda Company of Harvey, Ill.

Kaiser has spent the past year in the Hendy turbine shops. He came to Hendy after 25 years with the Honolulu Iron Works, Honolulu, T. H., where he served as sales and service engineer, selling and installing many well-known makes of Diesel engines, especially for tugs and fishing boats, and making Diesel-electric installations for power and light concerns. He also handled Allis-Chalmers tractors and P. & H. excavators. Kaiser gained his preliminary training at the Oakland, Calif., plant of the Atlas Imperial Diesel Engine Company.

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PORUS-KROME

a fish story...but true



Part of New England Fleet at Boston Fish Pier

80% of the New England fishing fleet boats have Lister-Blackstone auxiliary Diesel engines. This rugged engine is made still more reliable by having PORUS-KROME liners in its cylinders . . . a standard specification for every Lister-Blackstone engine.

PORUS-KROME resists both corrosion and abrasion and multiplies cylinder life from 4 to

20 times. Its porosity assures better lubrication, too. These characteristics are especially needed where the engines "run cold" as they do in fishing boats . . . and in other engines, too, which are used in cold weather.

Whether you build engines or use them, be sure that PORUS-KROME is on the cylinder walls. Write for full information.

PORUS - KROME

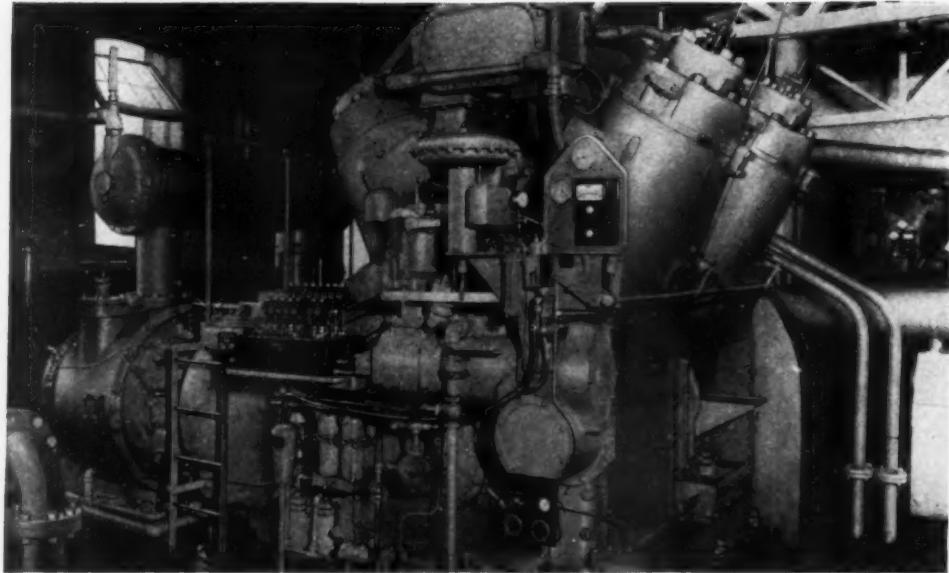
Good for the Life of your Engines

VAN DER HORST

U. S. PATENTS 2,649,378 AND 2,314,604

VAN DER HORST CORPORATION OF AMERICA OLEAN • NEW YORK

AN AFFILIATE OF DRESSER INDUSTRIES CLEVELAND 11 • OHIO



Diesel compressor units equipped with

alnor

Exhaust Pyrometers

This Cooper-Bessemer Type G-MV Diesel engine driven compressor is one of several such units supplying constant air power for pneumatic tools at one of the great shipyards. Dependable operation is of the greatest importance, and the Alnor Exhaust Pyrometers used here provide a reliable check of exhaust temperatures and a guide to uniform performance.

You will find Alnor Pyrometers used with Diesel and gas engines in all types of applications.

Write for bulletins describing the complete line.



ILLINOIS TESTING LABORATORIES, INC.

**420 North La Salle Street
Chicago 10, Illinois**

New Mobile Air Cleaner Test Unit

THE Donaldson Co., Inc., makers of oil-washed cleaners and the positive system of crankcase ventilation announce the development of a new, mobile air cleaner field test unit, which is offered to manufacturers for their use without cost or obligation.

This Donaldson innovation can go anywhere on its two-wheeled chassis behind any passenger car. For purposes of duplicating working conditions in the field it can be drawn behind the tractor or other machine. Or, it can be parked adjacent to stationary units in operation. Completely self-contained it is equipped with two internal combustion engines which power individual blowers to provide the desired air flow for testing purposes. As many as four cleaners can be tested simultaneously. The unit was developed to substantiate laboratory findings and to make field testing easier and more accurate.

Tests made with the Donaldson Field Test Unit can be accepted as conclusive, because the conditions under which tests are made are precisely those under which the installed cleaner would operate. Manufacturers are invited to write for more information.

National Supply Elects E. H. Thorsteinson



E. H. Thorsteinson

ELECTION of E. H. Thorsteinson as vice president and controller is announced by The National Supply Company, Pittsburgh. Mr. Thorsteinson joined the company as controller March, 1942, coming from Montgomery, Ward & Company, Chicago, where he had been assistant general controller.

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BRUTE POWER



● Good governing of diesel engines in construction, mining or other industrial applications, promotes greater operating efficiency and longer, economical service—two things dear to the operator's heart.

And that's the reason Pierce Governors, as original equipment on many of the world's leading diesel engines, and replacements on many others, are setting the pace in every field where diesel power is used.

Pierce governing is good governing—mechanically dependable and sensitively responsive through the time-proved flyball principle. And in service, Pierce Governors often outlast the engines, themselves.

Pierce Governors for diesel engines are available in two types—driving directly from the fuel pump or independently of the fuel pump shaft. If your engines are not now Pierce-governed, write for full information and the new Pierce catalog. And specify Pierce on the new engines you buy.



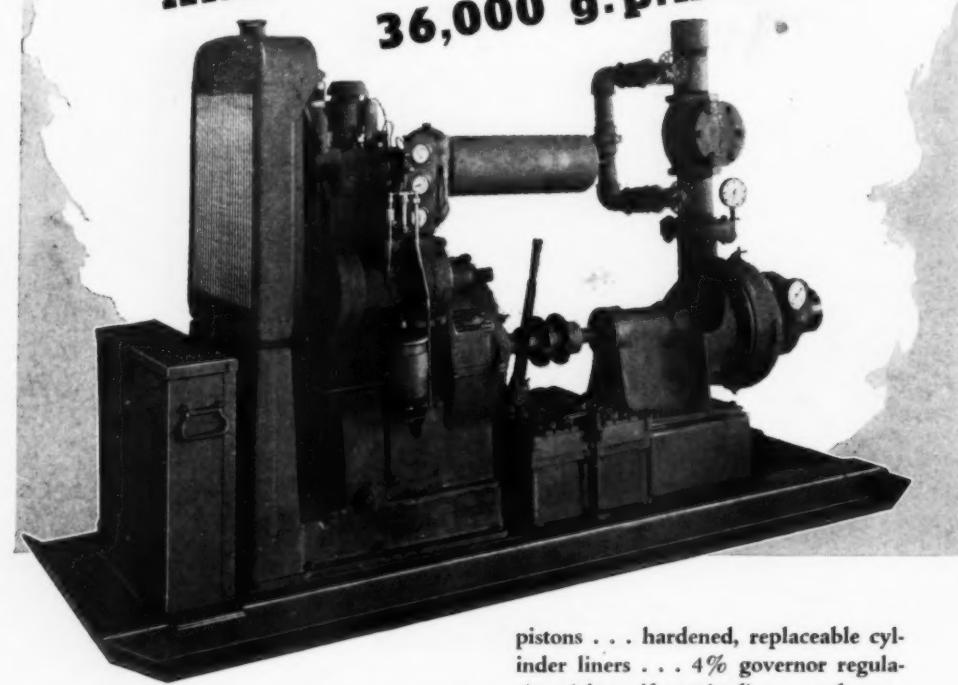
THE PIERCE GOVERNOR COMPANY, INC. • 1606 OHIO AVENUE • ANDERSON, INDIANA
Manufacturers of Pierce Precision Governors and Sisson Automatic Chokes

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GOVERNORS

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A BIG NICKEL'S WORTH OF DEPENDABLE POWER!

Sheppard Diesel Driven
Allis-Chalmers Unit Pumps
36,000 g.p.h. for 5c



THE Sheppard Diesel 7-A Engine direct-connected to this Allis-Chalmers unit provides power to pump 36,000 gallons per hour with a 30 foot head. Fuel cost is 5c per hour. That's a lot of dependable power for a nickel!

This Sheppard Diesel reduces the cost of washing sand, coal, silt in oil field pumping operations. It is also ideal for standby fire protection. That's because complete dependability and readiness to go into action at any moment are assured by Sheppard Diesel's oil cooled

pistons . . . hardened, replaceable cylinder liners . . . 4% governor regulation (closer if required) . . . and, especially, by the simplified Sheppard fuel injection system that stays out of trouble.

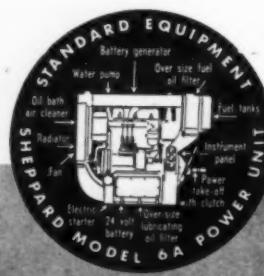
What's more, a Sheppard Diesel is not only ready to go into action at *any* moment—it's ready to go into action *the moment you receive it*. It's delivered complete. You need only add fuel and water and press the starter button.

And once you press the starter button on a Sheppard Diesel, you're on the way to learning how low in cost dependable power can be.

We, too, are busy trying to help end this war as speedily as possible. But the reconstruction that lies ahead is an important problem and, like other thoughtful industries, Sheppard is planning for it. Sheppard engineers are ready to help you plan your post-war Diesel requirements now. To essential industries, a few Sheppard Diesels are available on priority. Write for information and illustrated data sheet on the Sheppard Model 7-A today.

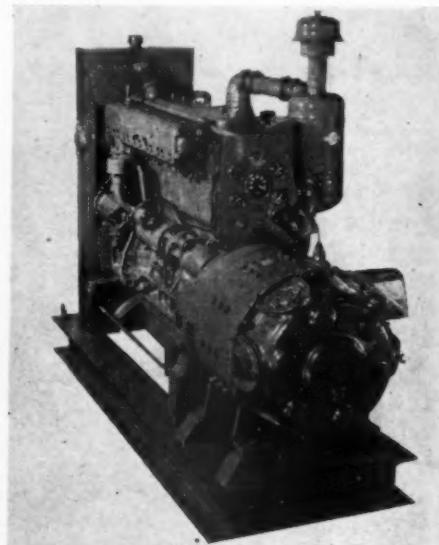
R. H. SHEPPARD COMPANY
HANOVER, PA.

Sheppard
ALL AMERICAN
DIESELS



Bardco Announces New Models of Diesel-electric Generating Units

A NEW model Diesel generating plant, originally designed for marine service but equally suitable for industrial applications where small size and maximum output are factors, is now in large scale production by Bardco Manufacturing & Sales Company.



The new Bardco generating unit powered by a Chrysler, six-cylinder Diesel.

The direct current model, DD40, is rated at 40 kw. for continuous service, with the alternating current model designated as DA40, with the same rating. Both plants have the new single-bearing Bardco generators, operating at 1800 rpm.

The direct current model for marine service has a compound wound, ABS dripproof generator, and is also equipped with an enclosed, self-contained fresh water cooling system that replaces the usual radiator. Within the sheet steel housing are the heat exchanger, make-up tank, gear-type raw water pump, and beneath these units a spare parts and tool cabinet.

To prevent operation at unsafe temperature or oil pressure levels, Bardco automatic safety controls stop the plant when water temperature or oil pressure reach predetermined levels. All sets have a 24-volt starting system, with an electric air-preheater for cold weather starting.

The generators are powered with model T126 Chrysler six-cylinder Diesel engines, connected to the generators by patented Bardco flexible couplings. These Bardco generating plants are now installed in commercial fishing vessels, and hundreds have been shipped for government and industrial service during recent months.

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ROGRESS



RESCUE!

BUILT by Levingston . . . powered by General Motors . . .
manned by the Allied Navies, these fast, powerful rescue
vessels are in front line service around the world.

* * *

Postwar, for the finest in marine transporta-
tion equipment and maintenance, look to

Levingston
SHIPBUILDING COMPANY • Orange, Texas

42 Million Miles . . .

Con't from page 56

Diesel passenger locomotives!

Fantastic though it sounds, when you compare it with 14,000 daily Diesel passenger miles on the Burlington, it all makes sense and the company deserves the undying enthusiastic praise of this nation for its contribution to railroad technology.

A couple of statistics are interesting at this point:

The three sizes of Diesel passenger units turn up general and running repair costs per mile as follows:

1,800 hp.	\$1147
3,000 hp.	\$1934
4,000 hp.	\$1514

Three classes of widely used comparable steam power turn up as follows:

M-4-A	\$2107
O-3	\$1913
O-5-A	\$1702

WEAR-LIFE IS ASSURED

Twin Disc Standard Power Take-offs and Reduction Gear units are equipped with single or two plate clutches of the gear-tooth type, depending on the horsepower to be transmitted and the diameter of the engine flywheel housing.

To assure the wear-life of the discs, well proportioned friction surfaces of ample capacity, coupled with adequate provision for heat dissipation, are provided.

To compensate for wear, the Twin Disc simple, one-point clutch adjustment is easily and quickly made through the hand hole provided.

These features, plus the positive action which firmly clamps the friction driving plate between the two driven plates, assure efficient clutch performance and maximum wear-life. For complete description and list of standard sizes available, ask for Engineering Bulletin 129. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

Hydraulic Torque Converter

Heavy Duty Clutch

Marine Gear

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
REG. U. S. PAT. OFF.

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

The Denver Zephyr per mile costs now run about 80c per train mile while the Twin Cities Zephyrs run about 92c per train mile compared with results of a study which showed about 25% higher with steam operation provided steam could make these runs. The Denver Zephyrs average about .40 miles per gallon of fuel. Obviously, from now on, the cost of Diesel fuel oil is going to be merely an incidental figure as far as gallons of fuel used per horse-power-hour or ton-mile are concerned. All the old predictions about thermal efficiency, etc., are now proved facts and the book can be closed on this. Maintenance and operation; heavy repairs, first cost, availability, speed and tractive effort curves are the main factors from now on in. Not forgetting, of course, electric brakes.

Recently the writer made the trip down from St. Paul on the Morning Zephyr. After a lapse of 8 years, since we last made this run, two things stood out on this type of 7-car train: First, the unusual amount of original equipment still aboard the locomotive after 8 years of running and 2.4 million miles of grueling service. Secondly, the remarkably effortless manner in which the Zephyr rode down the Mississippi shoreline mile after mile at from 80 to 95 miles per hour, the faster we went the smoother the whole train rode. The conductor told us "Folks would rather wait 2 days for a reservation to ride on this sadly overcrowded, wartime Zephyr run, than ride a fine steam train on 30 minutes notice. Yep, the Diesel engine still has a funny sort of appeal with the customers"!!

At Aurora, it dawned on us, after Engineer Tom Morrissey, 54-year Burlington veteran engineer—the oldest living engineer actively at work in the U.S.A. who first piloted the Pioneer Zephyr, when his reluctant engineer-brothers were afraid of fast trains, mused that the Zephyr "Rode like an airplane. Riding a Zephyr is a flight over land, not a train ride."

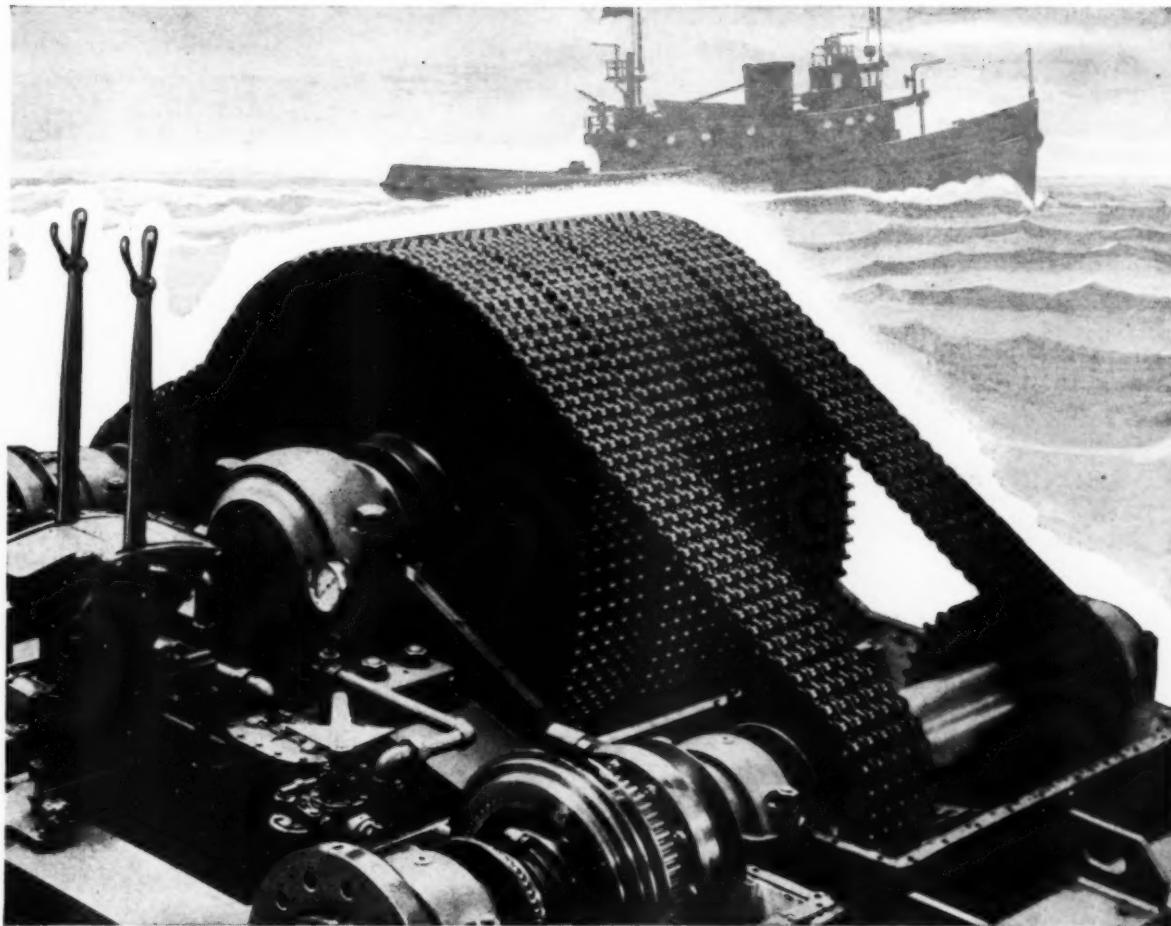
From McCook, Neb. to Denver, Colorado, while riding the Denver Zephyr, Train No. 1, the speedometer registered 88 miles per hour, for almost 40 continuous minutes. The 255 mile run, mostly uphill, is regularly scheduled in 4 hours 22 minutes. We observed to Engineer George Perkins that "We sure ride like the wind." Observes Engineer Perkins: "Not today, sir, one of our 900 hp. engine's out cold . . . been out since the train left Galesburg, an hour out of Chicago." He was correct, we were running about 30 minutes late. So, here was a beautiful, practical example of the characteristics of a Diesel locomotive. With but one of

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WHY MORSE ROLLER CHAIN WAS SELECTED TO TRANSMIT POWER ABOARD THE YT-277 AND HER SISTERS . . .

and why roller chain does a better job of transmitting power ashore or afloat

Morse Roller Chains, used to transmit the power of two 650 hp Diesels to a single propeller shaft aboard the Navy Harbor Tug YT-277, were selected because of their ability to withstand long and rough usage. Flexible, yet positive as gears, these precision chains, employed as integral parts of the reduction unit, connect sprockets from each engine drive shaft to separate sprockets on the propeller drive shaft. In this way, the advantages of driving a big propeller at slow speed are fully utilized. Too, the use of long-lasting Morse Roller Chain eliminates the need for much maintenance; and, since they can't slip, they deliver high power loads without power loss.

Mobile Power Plants Ashore Ashore and afloat, specially designed Morse Dual Drive Units employing Morse Precision Roller Chain, Morse Couplings and Morse Clutches, are used for multi-engine power transmission to a single shaft. Available as complete self-contained units, they are automatic-control equipped to operate one or more engines as power demands require. Mounted on rail cars or trucks, with engines, they make ideal mobile power units—that are going places in the lumbering industry, the oil field, and, soon, in your field.



SPROCKETS

CHAINS

FLEXIBLE COUPLINGS

CLUTCHES

MORSE *Roller and Silent* CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT, MICH. • A BORG-WARNER INDUSTRY

its two 900 hp. 12 cylinder Diesels running, the other 900 hp. and the 1,200 hp. Diesel pulled the Denver Zephyr on its tight 66 mile per hour schedule only 30 minutes late from Galesburg to McCook, a distance of 617 miles, and we lost only 9 more minutes all the 255 miles between McCook and Denver, with 30% of its power dead out, cold!

The Four Zephyr Stars in the Burlington fleet—the Twin Cities Zephyrs and the Denver Zephyrs, each are unique in addition to in-

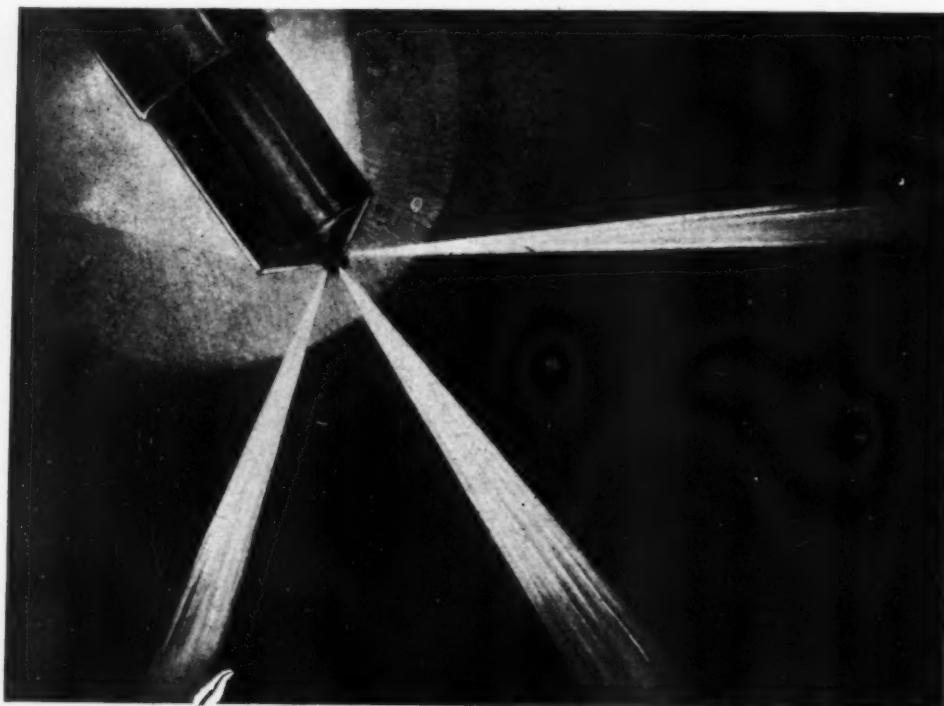
numerable other things, in that they carry separate Diesel power plants in their baggage cars for generating not d.c. but a.c. for a pair of 3-wire train circuits to run the air conditioning and lighting and power using equipment.

The Twin Cities Zephyrs carry three 6 cylinder 85 hp. heavy duty Cummins Diesel engines, mounted crosswise of the baggage car, and directly coupled to 50 kw. 3-phase, 60 cycle 220 volt General Electric generators. Each has its own radiator built into the side of the car,

with belt driven fans exhausting outward. The Denver Zephyrs carry four identical units, instead of 3.

These unique independent power plants remove about 255 to 350 hp. of parasite load from the locomotive Diesels, and by use of an ingenious control system and dual circuits, they provide ideal lighting and air conditioning power for the entire trains. In cool weather only half their output is required.

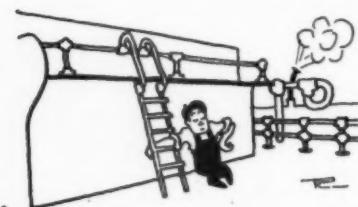
Each has its own starter and 32 volt Exide battery set and a 1½ kw. self-contained generator for charging. The fact that they're still in good condition, with no changes, after 8 years, proves they must deliver the goods. They were No. 1 Experiments too, remember.



NOW-INJECTOR SPRAY TIPS *for the Diesel Industry*

Fuel injector spray tips vary widely as to design—almost as widely as the different makes of Diesels—but certain characteristics are common to all tips: i.e. high grade materials and a high degree of precision. Already supplying the Diesel Industry with microscopic precision drills and reamers our plant facilities are ideally suited to the manufacture of injector spray tips precisely to specification. Some Diesel engine manufacturers have given us this difficult part of their production to handle. Send us your spray tip specifications and we will gladly submit an accurate reproduction—tell us your requirements and we will gladly quote prices.

"The Only Business Of This Kind In The World"

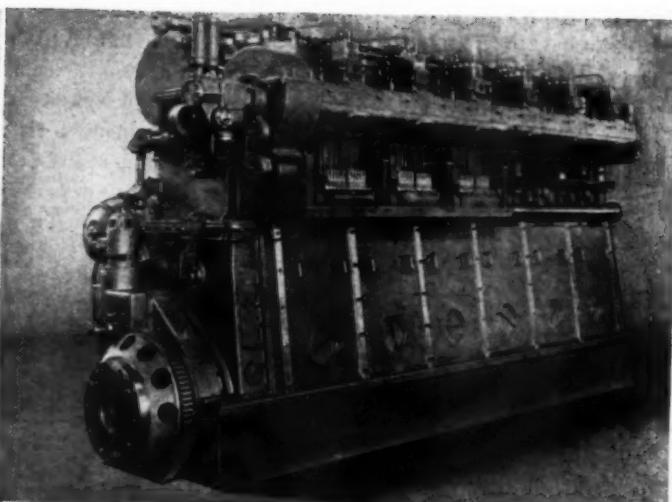
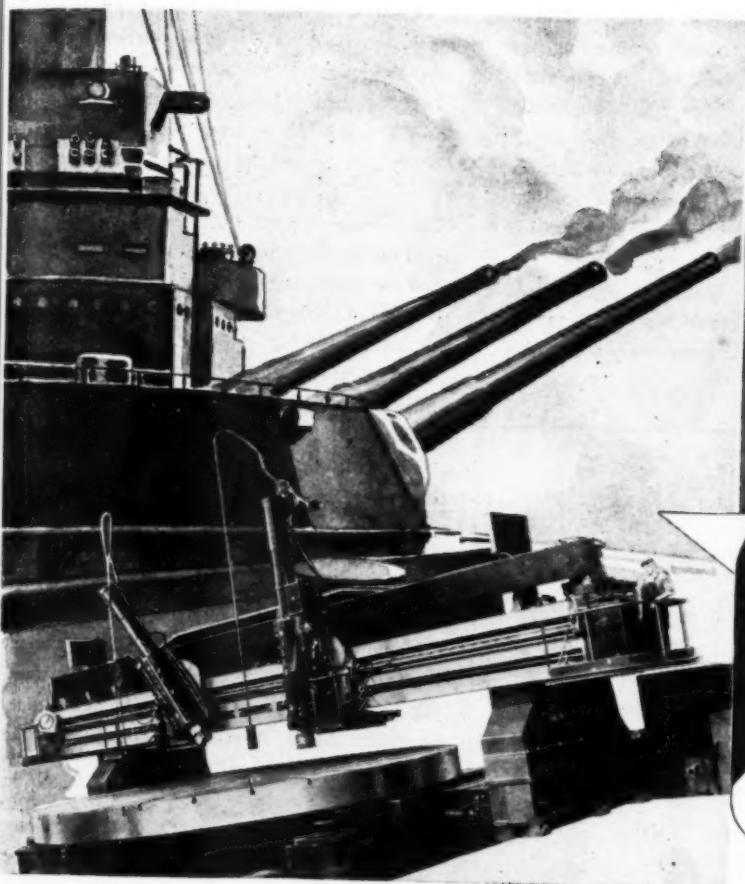


Electric Machinery Gets Maritime "M" Award

THE Maritime "M" was recently awarded to the "R" Division of the Electric Machinery Mfg. Company. This new award, plus the Army-Navy "E" earned the early part of the year, accords the honor to Electric Machinery as the second manufacturing concern in Minneapolis to fly both the "E" and "M" pennants.

A. D. MacLean, director of the Production Division of the Maritime Commission, presented the "M" award to the company and C. R. Zimmerschied, manager of the "R" plant. All employees received the "M" merit badge. The "R" Division plant of Electric Machinery was built in record time in the latter part of 1943 to produce marine-type, d-c electric motors for the Victory Fleet Program. The manufacture of these marine motors was a new venture for E-M and required a new plant plus a new organization. Many tough problems, both as to engineering and production, had to be overcome before motors were rolling off the assembly lines destined for the Victory ship fleet. That is the basis for the Maritime award; recognition of the splendid production achievements of the "R" Division employees. W. H. Feldmann, Electric Machinery president, states that the "R" Division plant will continue to operate and build motors and generators after the war.

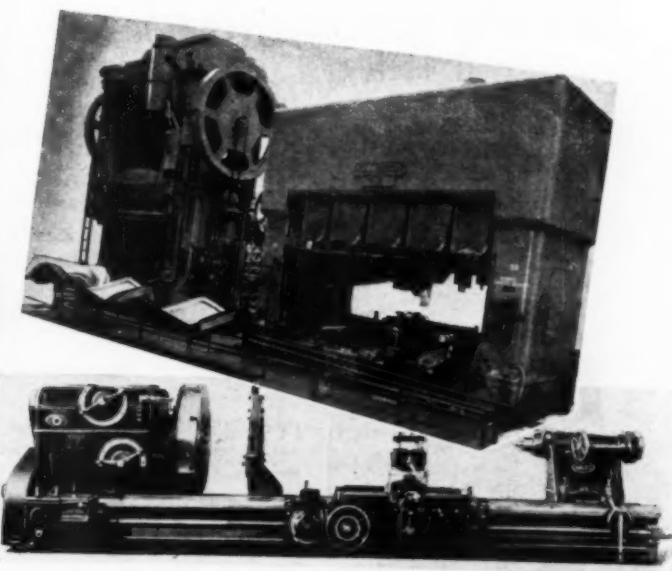
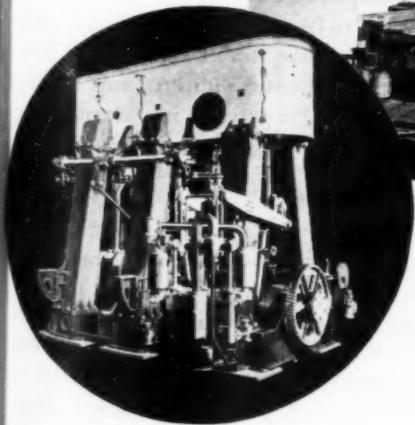




**WHAT IT TAKES
TO WIN
THE PEACE**

HAMILTON STEAM AND DIESEL ENGINES • CANNON • MACHINERY TO BUILD THEM ALL

BUT KEEP THAT GUARD UP!



**GENERAL MACHINERY CORPORATION
HAMILTON, OHIO**

THE NILES TOOL WORKS CO. • THE HOOVEN, OWENS, RENTSCHLER CO. • GENERAL MACHINERY ORDNANCE CORPORATION

DEMA Holds Regional Conference



At the Diesel Engine Manufacturer's Associa-

tion luncheon, held in New York, November 18, 26 instructors of Diesel engineering sat down with 17 engine builders. Other invited guests, plus members of the press, brought the total turnout to 53. A new high was reached as to frankness of expression from manufacturer and college dean as they discussed the problem of turning out for the industry better trained Diesel men.

Ralph Miller, chief engineer of development and research for Worthington Pump & Machin-

ery Corp., declared that American engine builders had to look to foreign countries for most of their designers. He asked why "90 per cent of the designers graduated from our own schools wander away from their original profession into other departments, such as sales."

"Because," answered Prof. Neil P. Bailey of Rensselaer Polytechnic Institute, "our American boys are pretty keen on which side their bread is buttered. They find they can draw higher salaries in fields other than designing." Gordon Lefebvre, president of Cooper-Bessemer Corp. and chairman of the meeting, added that in Europe, designers generally are accorded more credit and prestige than is the case in this country.

The manufacturers agreed that the type of graduate engineer most useful to them was the man with a broad, basic education in mechanical engineering, with enough machine designing and shop work to enable him to understand the nature and operation of a Diesel engine. Specialization in Diesels fitted better into the post graduate picture, they agreed.

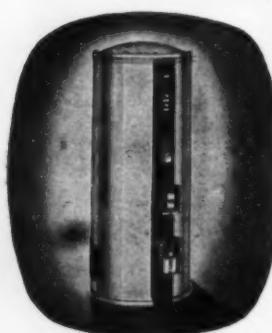
Members of DEMA's educational committee who reported on various phases of engineering instruction were John W. Anderson, American Locomotive Co.; W. E. Wechter, Worthington Pump & Machinery Corp.; Henry J. Barbour, Fairbanks, Morse & Co.; L. L. Peterson, Nordberg Mfg. Co.; T. C. Webb, Clark Bros. Co. Inc., and Paul J. Every, Baldwin Locomotive Works.

New Petroleum Solvents Warehouse

PETROLEUM Solvents Corporation has opened a new warehouse at Dirks & Co., 416 North West 14th Avenue, Portland, Oregon to service the Northwest. Sidney F. Croft has also been added to the field staff of Petroleum Solvents Corporation and will assist Louis List, the Southern District Manager. O. C. McIntosh, formerly with the Perfect Circle Piston Ring Co., is now associated with Petroleum Solvents Corp. as their Pennsylvania representative.

Magnetic Plug Reduces Bearing Wear

AN effective way to reduce bearing wear—at extremely low cost—is to replace drain plug with Magnetic Plugs. By means of a powerful magnet, Lisle Plugs are said to remove dangerously sharp metal particles from the circulating lubricant. This magnet contacts the oil or grease and captures the abrasive metal cutting as they flow past. For full particulars write Lisle Corporation, Clarinda, Iowa.



HONAN-CRANE CORP.
Subsidiary of Houdeille-Hershey Corp.
600 Indianapolis Ave. Lebanon, Ind.

To Get Results You Must Have an Oil Purifier With Capacity!

Capacity to remove all abrasives, sludges, acids and destructive contamination.

Capacity to remove this contamination as fast as it is liberated by the operation of the engine.

Honan-Crane "Continuous" Oil Purifiers Have Capacity.

CAPACITY to remove all abrasives, acids, sludges and other types of non-lubricating contamination.

CAPACITY to keep oil "continuously" clean. According to model sizes, single refills will remove from 6½ to 900 pounds of dangerous contamination.

Does Your Oil Purification Equipment have the Capacity to do the job?

[WRITE FOR ENGINEERING BULLETINS AND COMPLETE DATA ON THE PURIFICATION OF ANY KIND OF FUEL OR LUBE OILS.]

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New Far-Air Filter Bulletin

THE Farr Company, Los Angeles has just published a four page bulletin entitled "Far-Air Filters," which describes and illustrates a new type of air filter in designs for all industries including Marine, Railroad, Aviation, Small Engine, Diesel Engine Assembly, Round and Automatic Cleaning Rotary types.

This interesting and educational bulletin contains technical information and graph charts valuable in any filter problem. Write the Farr

Company, 2615 Southwest Drive, Los Angeles 43, California today for your free copy.

New Tachometer Bulletin

BULLETIN No. 44-1, just published by Jones Motrola Company, manufacturers of tachometers and other industrial products, describes four models of Jones individual-mount tachometers and the Jones multi-range portable hand tachometers.

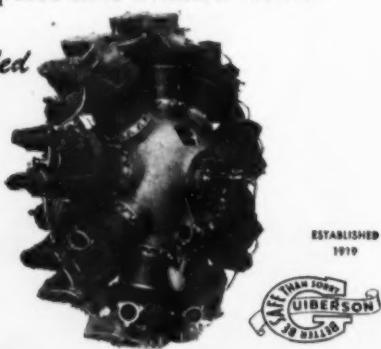
The bulletin shows both full-face and profile



There's something in the wind—an ever-growing murmur that is reaching the ear of alert aeronautical engineers, traffic men, maintenance men and executives in aviation. And that something is the fact that cheaper fuel, lower fuel consumption, no ignition system, minimum fire hazard and dependable operation will make the new light-weight diesel one of America's foremost engines for fast, low-cost transportation in America's peace-time aviation world.

America's
Radial Air-Cooled
Diesel Engine

Producers of Oil
Tools, Oil Heating
Units, Aircraft Parts
and Diesels.



Guiberson U.S.A.

**GUIBERSON DIESEL ENGINE CO.
THE GUIBERSON CORPORATION**

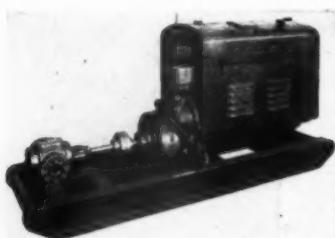
DALLAS, TEXAS

views of the individual tachometers, rpm. ranges available, mounting dimensions, and includes prices for tachometers and appurtenances, a section on use and operation, and general installation data. Jones Motrola Company, Fairfield Avenue, Stamford, Connecticut, will mail Bulletin No. 44-1 upon request.

New Blackmer Gathering Pump Unit For Oil Fields

A NEW pumping unit, designed and built by Blackmer for use in the oil fields as a gathering pump has just been announced by J. B. Trotman, general sales manager of the Blackmer Pump Company, Grand Rapids, Michigan.

The specifications of the new unit are as follows: Capacity, 50 gpm.; pressures to 500 psi; mechanical efficiency at 500 psi 70%; suitable for suction pressures from 0 to 100 psi; will handle crude oils of viscosities from 40 ssu. to 200 ssu—specific gravity .82; power—25 hp. gasoline engine, mounted on common fabricated steel skid with pump, reduction gearing and clutch.



New Blackmer gathering pump unit.

The pump is equipped with special anti-friction bearings. The stuffing box is so designed that vacuum is maintained on the packing chamber thus reducing leakage to an absolute minimum.

New Heat Transfer Bulletin

THE Whitlock Manufacturing Co. has announced its new Bulletin No. 641 covering an extensive line of heat transfer equipment. Illustrated and described in this 15-page bulletin are heat exchangers of the shell and tube type featuring both U-Bend and straight tube construction, also multistage types all designed for easy removal of tube bundles for cleaning. The Whitlock line includes jacket water coolers, lube oil coolers, and fuel oil heaters as well as a wide range of industrial heat transfer equipment and prefabricated piping. The Whitlock Manufacturing Co., Hartford, Conn., will mail Bulletin No. 641 upon request.

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MACK MARINE

SAE 1945 Annual Meeting Program Ranges Gamut of War's Engineering Needs

VIRTUALLY the gamut of wartime automotive engineering needs is covered in the program for the 1945 Annual Meeting of the Society of Automotive Engineers announced by SAE General Manager John A. C. Warner.

Outstanding wartime engineering papers to be presented at the meeting, which is scheduled for January 8 through 12, 1945 in the Book-Cadillac Hotel at Detroit, Mich., include reviews of the contributions of industry to Ordnance tank-automotive engineering and of the metallurgy of enemy automotive equipment. These papers are to be presented by Col. John M. Colby and Col. J. H. Frye, both of Office Chief of Ordnance, Washington, D. C.

Numerous other papers will be concerned with wartime automotive engineering developments, including water-alcohol injection, heated wings for aircraft, methods for calculating torsional vibration, induction heat treatment of internal surfaces, trends in airport design, and basic factors of helicopter design. A portion of the program will be devoted to post-war application of wartime engineering progress, with C. F.

Kettering, of General Motors Research Laboratories Division, speaking on "Fuels and Engines for Higher Power and Better Efficiency."

A substantial proportion of the program is given over to technical papers on processing and applications of automotive materials, such as synthetic rubber, fabrics, and steel. Aircraft Sessions will present papers on electronic controls, hydraulic braking systems, and related subjects. Sessions concerned with the engineering of land vehicles will present technical papers on cold starting, multiple power plants for trucks and buses, power steering, and Diesel engines.

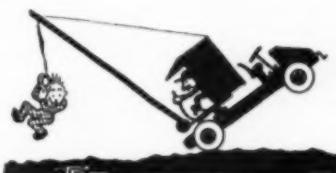
Busch-Sulzer Bros. Announce New Appointments in Sales Organization

THE Busch-Sulzer Bros.-Diesel Engine Company, has announced the appointment of Joseph G. Broz as Vice President in charge of sales also the appointment of Charles E. Beck as Sales Manager. Mr. Broz was formerly Sales Manager of the Diesel Division of Baldwin Locomotive Works also Sales Manager and Director of the Baldwin De La Vergne Sales Corporation. Charles Beck has been associated with the Busch-Sulzer Sales Department for the last 26 years.

A. P. Emmert New President of Warner Gear Division



Arthur P. Emmert (left), newly-elected president Warner Gear Division, Borg-Warner, confers with E. S. Russey (center), vice president and general manager, and J. O. Moore, works manager. Emmert succeeds C. S. Davis, Borg-Warner Corporation president who has retired from his division post to devote his entire time to affairs of the parent organization.



A GREAT TEAM: MACK AND

OPAL



"Opal," the new 42 x 10 x 5½ dragger owned by Captain Joe Handley of Seattle, Washington, is powered by a Mack Mariner 605-W.

Mack
DIESEL MARINE POWER



When you've got a boat as well-designed as "Opal," just any old engine won't do. You want the best—and Owner Joe Handley has it in the husky Mack Mariner that drives "Opal" along!

Mr. Handley's own experience had a lot to do with the choice of a Mack. All along the west coast (as well as the east coast, gulf and inland waters) you'll find Mack is preferred by fishermen who know . . . men to whom an engine's dependability and operating economy can mean the difference between profit and loss.

Mack is built with the requirements of such men in mind. Built to the highest standards in the industry. Built in the great Mack tradition to be more engine, more dependable, more efficient, and to give every owner more reason to be glad that he chose a Mack!

MACK MANUFACTURING CORPORATION
Marine Engine Division,
Empire State Building
New York 1, N. Y.

MACK MARINE ENGINES ARE A PRODUCT OF THE BUILDERS OF WORLD-FAMED GASOLINE AND DIESEL-POWERED TRUCKS, BUSES AND FIRE APPARATUS.

Weatherhead Appoints Director of Purchases

THE appointment of G. Richard Young to Director of Purchases for The Weatherhead Company, Cleveland, is announced by H. F. Bailey, company financial vice president.

Mr. Young comes from Westinghouse, Lima, Ohio where he was assistant purchasing agent for several years, and assumes the purchasing seat at Weatherhead as successor to Charles T. Craig, recently appointed manager of the company's Chicago sales office and territory. A

native of New York City, Young was graduated from Massachusetts Institute of Technology in 1938 with degrees in engineering and business administration. He is a member of the Beaver Key Society of that university and Sigma Nu fraternity.

Bendix Scintilla Division Reports Output of Over 2 Million Units in 3 Years

THE Scintilla division of Bendix Aviation Corporation and its sub-contractors have produced more than two million units of such

precision equipment as aircraft magnetos, ignition switches and harnesses, spark plugs and Diesel fuel injection devices since Pearl Harbor it was disclosed recently by Herman Hanni general manager.

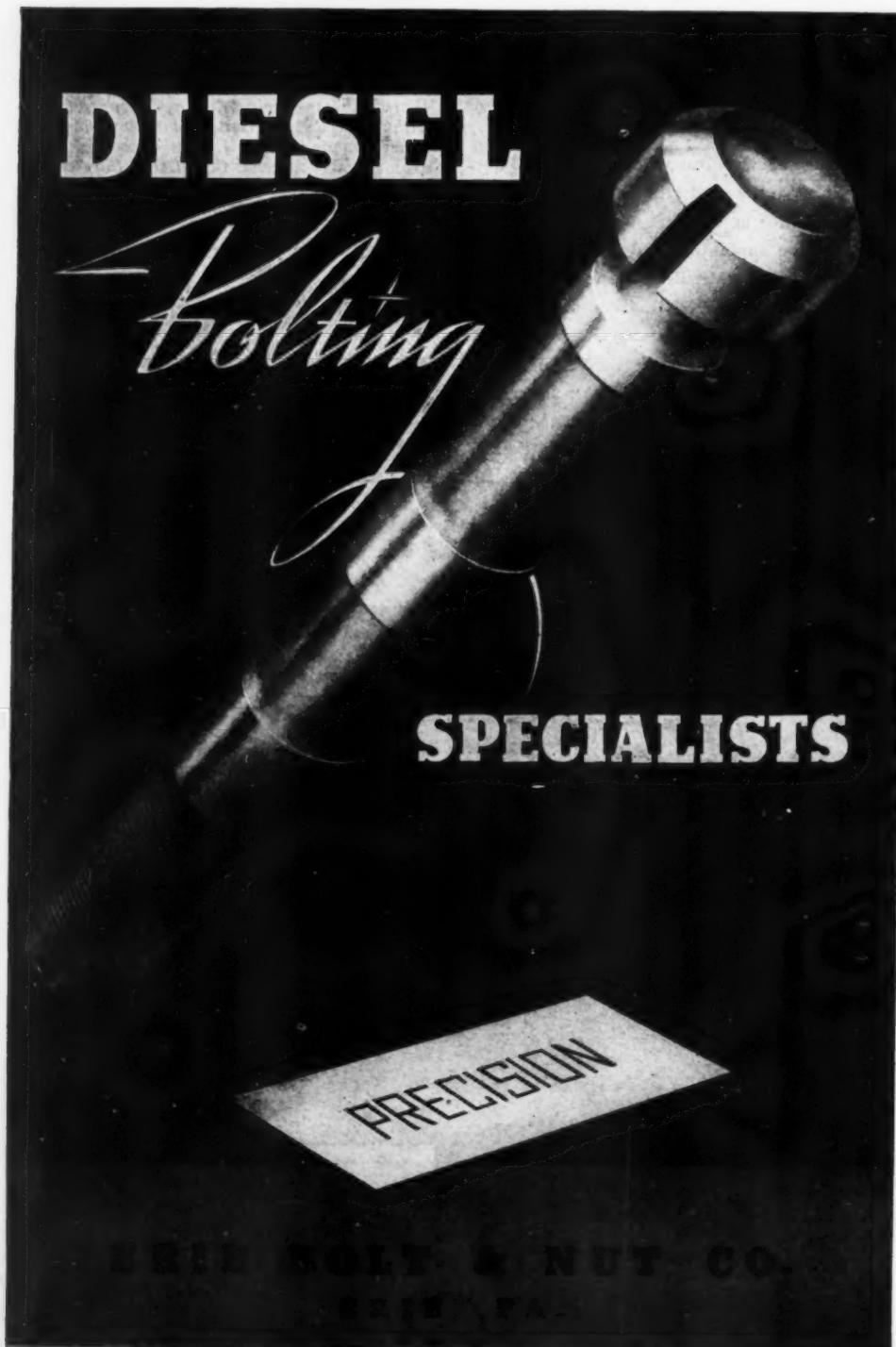
In the three years since the Japs bombed Pearl Harbor, Scintilla has delivered to the armed forces more than 766,500 aircraft magnetos and battery ignition distributors, 248,800 aircraft ignition switches, 1,356,000 aircraft spark plug, 75,000 radio-shielded ignition harnesses, thousands of aircraft ignition service parts and 52,700 Diesel fuel injection systems including pumps, nozzles and nozzle holders, it was stated. At the start of 1940, the division employed a total of 1,120 workers. Its payrolls had jumped to 3,745 by December 7, 1941 and climbed to a peak of 8,472 in 1943. Scintilla is currently engaged 100 per cent in production for the armed forces, it was stated.

New Bulletin on Batteries for Diesel Locomotive Service

THE first complete bulletin, especially devoted to storage batteries for Diesel locomotive service to come to our attention, is Bulletin No. 700 titled, GOULD KATHANODE GLASSKLA BATTERIES FOR DIESEL LOCOMOTIVE SERVICE. Moreover this 20-page booklet includes a graphic history of the trend to Dieselization on Class I, II, and III Railroads in addition to detailed information on the construction, selection and maintenance of Gould batteries. Complete specifications on the full line of Gould Diesel-type batteries are presented in convenient tabulations with characteristic discharge curves for each type battery. A section of the bulletin clearly outlines the theory of the lead acid storage battery. A valuable and informative book for engineers and operators alike. Write on your company letterhead for your free copy of Bulletin No. 700 to Gould Storage Battery Corporation, Depew, New York.

J. W. Baillie Resigns From Detroit Lubricator

"THE resignation of J. W. Baillie, Secretary and Treasurer of the Detroit Lubricator Company has been announced by C. H. Hodges, President, effective December 1, 1944. On that date Mr. Baillie will become active President of the American Gas Machine Company, Albert Lea, Minnesota, on whose Board of Directors he has served for the past three years and in this capacity has been in close touch with the company's various activities. Mr. Baillie leaves the Detroit Lubricator Company with the best wishes of his associates for his continued success."



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For Emergency Power in Devastated Areas!



300 KW POWER PLANT ON WHEELS

EVER in the vanguard of victory, this mobile power plant is used today for the immediate restoration of light and power in conquered, war-torn areas! Here, where performance is all important, Diesel engines as well as men, cannot fail!

Performance is assured, for the heart of this vital rehabilitation unit is the CP 612 Diesel Engine. Selected for its dependability, compact design and outstanding service, the CP 612 Diesel operates

at 750 rpm., demonstrating the smooth-running efficiency and the rugged construction characteristic of all CP Diesels.

CP DIESEL ENGINES, in 23 sizes, ranging from 3 to 8 cylinders, 150 to 1000 hp., are supplying economical dependable power to countless home front industries.



CHICAGO PNEUMATIC
TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N.Y.



National Forge Among First Winners of 5th Star

THE 5th White Star is now appearing on a very few Army-Navy "E" flags. Among the first to receive this latest citation for sustained excellence in war production is the National Forge & Ordnance Company, Irvine, Warren County, Pennsylvania.

To be eligible for the 5th White Star a company must be engaged in continuous war pro-

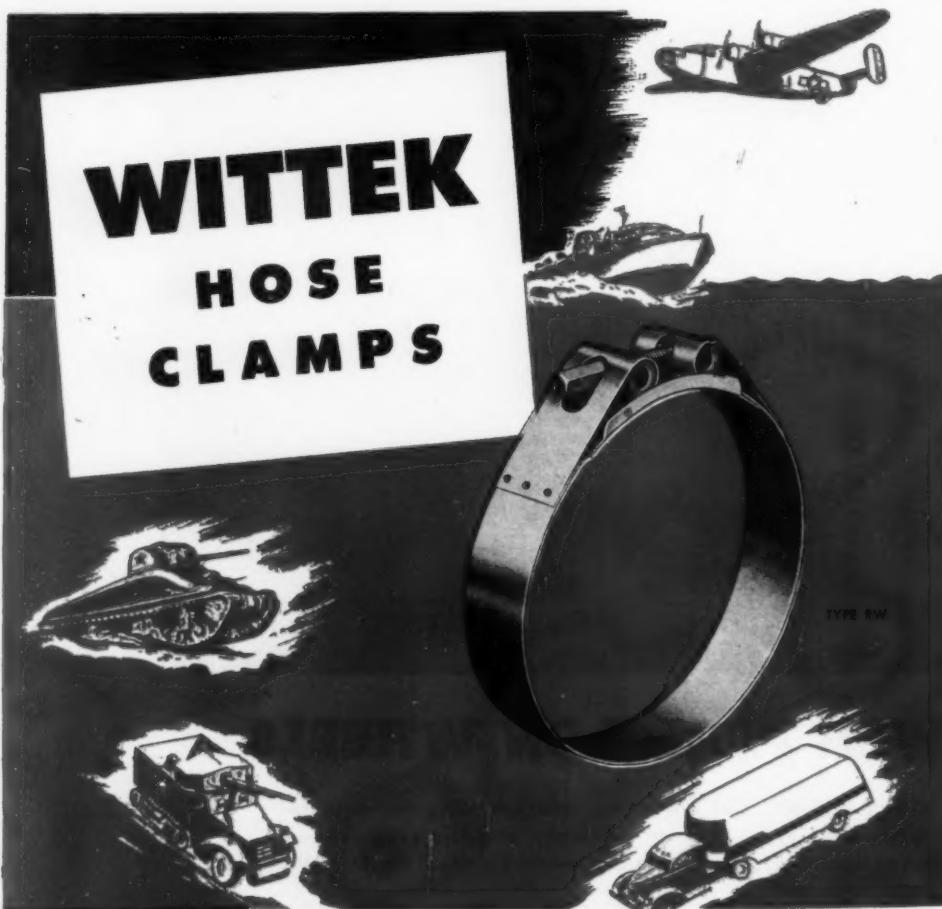
duction for at least three years and have received four previous white stars in addition to the basic Army-Navy "E" flag. In the case of National Forge, their first "E" award came to them from the personal hands of the late Frank Knox, when he was secretary of the Navy. This award was made on October 24, 1941—six weeks before Pearl Harbor.

In advising president John C. Harrington that National Forge had merited the 5th Star Award,

Admiral Bloch, chairman of the Navy Board for Production Awards, stated, "The Army and Navy congratulate the National Forge & Ordnance Company on being one of the first to be awarded a fifth renewal of the Army-Navy "E" award. During the coming year the five stars on the "E" flag proudly flown over your plant will be proof to everyone that the National Forge & Ordnance Company is continuing to do its utmost to assist the Army and Navy. The members of the armed forces highly appreciate the inspiring record which has been established by the untiring efforts of each and every man and woman in your plant."

Van der Horst Signally Honored

HONORED by award of the first Army-Navy "E" ever known to have been won in so brief a period is Dr. Hendrik Van der Horst, shown below, checking the work of two of his plant employees for whose processing of Diesel liners for the Navy the "E" pennant was received. Of the thousands of liners being given Poros Krome protection that makes them wear up to 20 times longer in service, only six-tenths of one per cent have been rejected in final inspection despite the regularly stepped up output achieved. In presenting the "E" award, the Navy's top-flight salvage expert, Captain Edward Ellsberg, cited Poros-Krome protection as one of the reasons why not one of all the Diesel engined craft used in the Normandy invasion was out of service because of engine failure on D-Day.



The dependability of Wittek Hose Clamps, long accepted by the automotive and aviation industries, is now being proven by actual service with the armed forces of the United Nations as standard equipment for aircraft, tanks, jeeps, trucks, ships and other combat vehicles. Wittek Hose Clamps are made in many different sizes and types for Diesel applications: Type RW for hose connections of 5" in diameter and larger; Type RM for 3½" to 5"; Type RN for 2½" to 3½" and Type FBC for 2½" hose connections and smaller. Write for new descriptive catalog. Wittek Manufacturing Co., 4305-15 West 24th Place, Chicago 23, Illinois.

WITTEK HOSE CLAMPS
Dependable Hose Connections



New Rotary Blower Bulletin

ROOTS-CONNERSVILLE Blower Corp. has just issued a new four-page general bulletin No. G-81-D, covering its Rotary Positive Blowers and gas Pumps, Centrifugal Blowers and Exhausters, Rotary Positive Vacuum and Liquid Pumps, Rotary Displacement Gas and Liquid Meters, and Inert Gas Generators.

This folder is profusely illustrated. Typical

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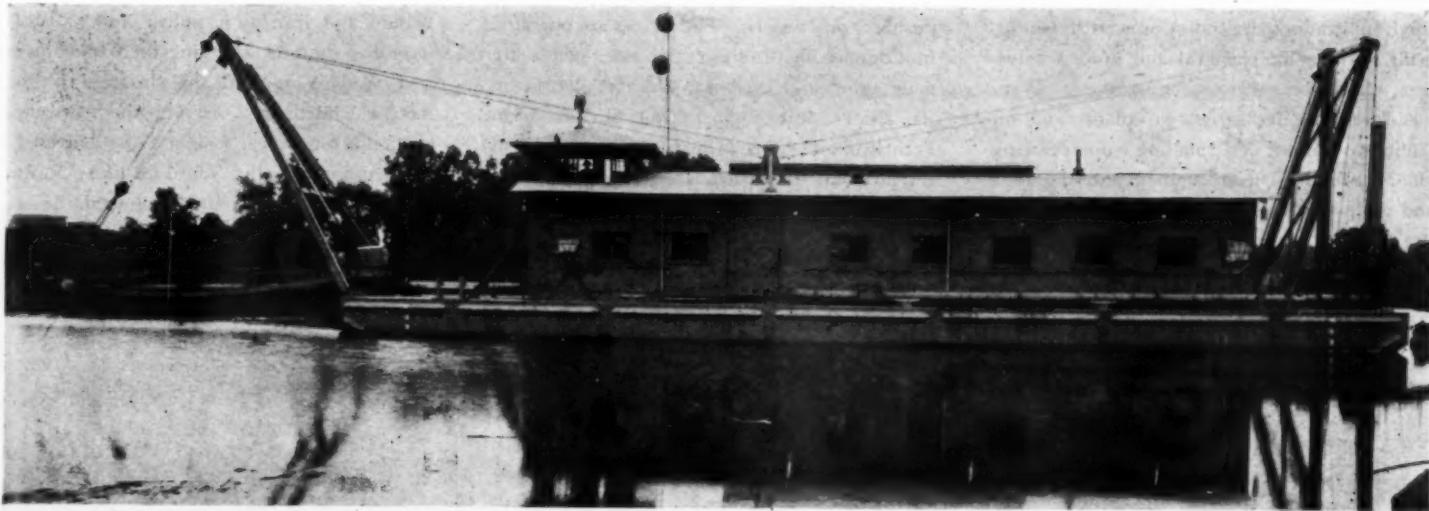
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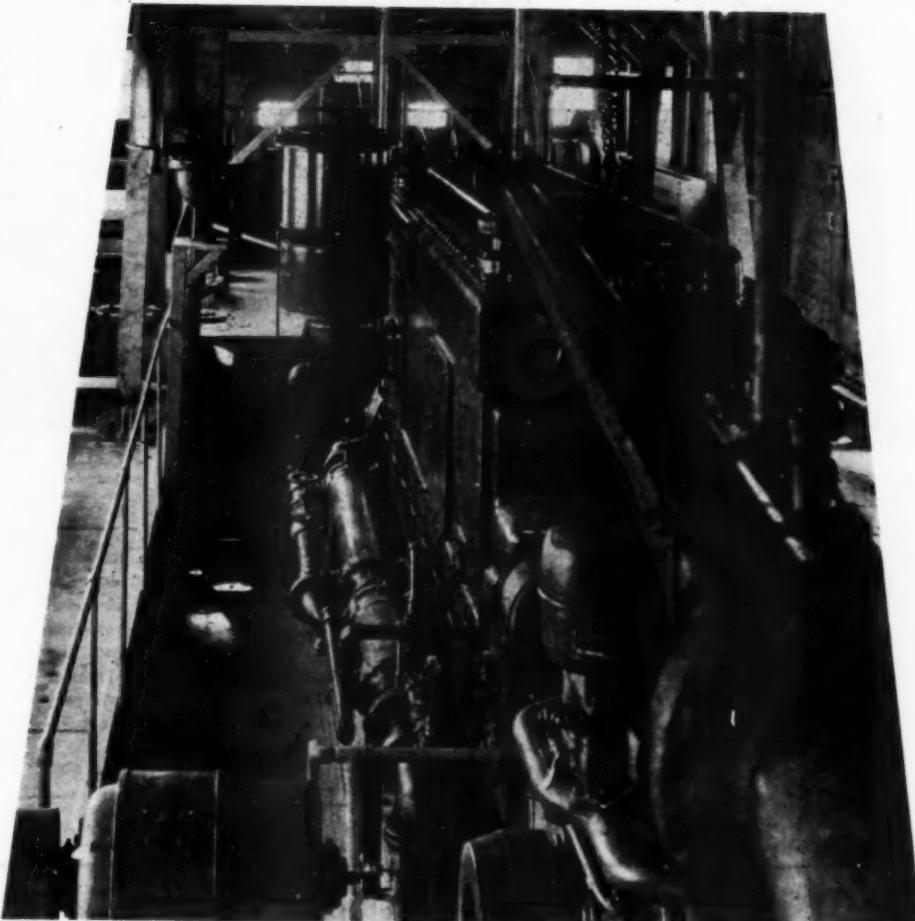
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BUCKEYE DIESELS for Army Engineer Dredges

The main dredge pump engines for a number of 12-inch hydraulic dredges being built for the United States Army Engineer Corps by American Steel Dredge Company, Inc., of Fort Wayne, Indiana, are eight-cylinder Model 80—10½" Bore x 12" Stroke Buckeye Diesels.

Confidence placed in these engines by the Engineer Corps is attested by the fact that these dredges are specially designed and equipped throughout to operate in isolated locations for long periods without supply service except fuel, lube and sustenance for personnel. We also know that the Buckeye Diesels are built to stay on the job, rendering carefree service under severe operating conditions.



Illustrations show the 104 ft. dredge with prefabricated steel hull also arrangement of the Buckeye main dredging Diesel.

Be Profitwise and Dieselize with Buckeyes
THE BUCKEYE MACHINE COMPANY LIMA, OHIO

installation views are shown covering the principal applications of Roots-Connersville equipment, such as the chemical and process industries, water works and sewage treatment plants, metal working industries, gas plants and oil refineries, mining and smelting, supercharging and scavenging Diesel engines, and the food and grain industries. The cut legends indicate the range of capacities, running up to 50,000 cfm. when handling air or gas, at a maximum of 30 lbs.

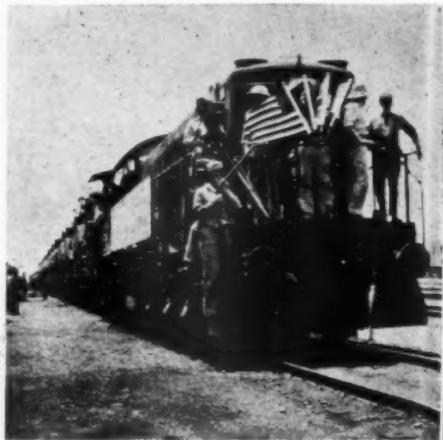
As recently announced, Roots-Connersville

Blower Corp. became "one of the Dresser Industries" on Nov. 1st. Two plants are operated in Connersville, Indiana and sales offices are maintained in New York, Chicago, Pottstown, Pa., Boston, Pittsburgh, Detroit, St. Louis, San Francisco, and other principal cities. Copies of the new bulletin are available on request to the main office or any branch.

Diesel Locomotive Delivers the Censored Millionth Ton to Russia

HEREWITH are two views of an Alco-G.E. Diesel-electric locomotive, one showing the four

flags of the United States, the U.S.S.R., Great Britain and Iran as it pulled into a Russian terminus, the other showing the banner it carried—announcing to all that the train this locomotive hauled was carrying the "Censored" millionth ton of war freight to be delivered to the Russians by the Third Military Railway service of the Persian Gulf command.

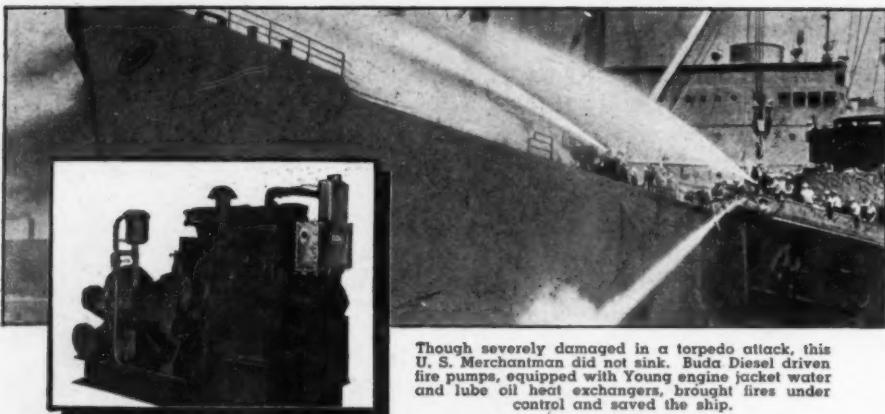


There have been many glowing accounts of the splendid performance of these American-built Diesel locomotives in this service, operating in the intense heat of Iran, over difficult trackage with staggering loads.

Roland G. Justus

ROLAND G. JUSTUS, 53 years old, manager of industrial sales of the Westinghouse Air Brake Company, died Thursday, November 30. In addition to his widow, Mrs. Ida Justus, he is survived by his mother. Mr. Justus started his career with the Westinghouse Air Brake Company in January 1911, as a clerk in the St. Louis office. He later became industrial representative in the southwestern district and in June 1932, was made general representative of the company in that district. He was appointed manager of industrial sales, with headquarters at Wilmerding, home office of the Westinghouse Air Brake Company, on July 1, 1940.

HEAT EXCHANGERS Developed for MARINE FIRE FIGHTERS



Though severely damaged in a torpedo attack, this U. S. Merchantman did not sink. Buda Diesel driven fire pumps, equipped with Young engine jacket water and lube oil heat exchangers, brought fires under control and saved the ship.

★ Specially designed Young Heat Exchangers with large surge compartment employed on Buda Diesel-driven Fire Pumps, maintain both the lube oil and engine jacket water at temperatures suitable to efficient engine operation. They are constructed of corrosion resisting materials for salt water use and are equipped with zinc pencils for protection against electrolytic action. They are compact, efficient, have removable tube nests, and are easy to service. So varied and extensive is the production of Young Heat Transfer Equipment that one of the many specially designed units may meet your everyday needs. If not, Young engineers can quickly and economically apply their wide experience to special installations for wartime or industrial uses. Write —

YOUNG RADIATOR CO., Dept. 235A RACINE, WIS., U.S.A.

Distributors: The Happy Co., Tulsa, Oklahoma • A. R. Flannery, Bell (Los Angeles), California • Wrightson-Campion, New York, N. Y. • W. P. Nevin Co., Chicago, Ill. • Calmes Engineering Co., New Orleans, La. • C. H. Bell, San Francisco, California. Export: Ameresco, Inc., New York, N. Y.

YOUNG

HEAT TRANSFER ENGINEERS

Manufacturers of Oil Coolers - Gas, Gasoline, Diesel Engine Cooling Radiators - Intercoolers - Heat Exchangers - Engine Jacket Water Coolers - Unit Heaters - Convectors - Condensers - Evaporators - Air Conditioning Units - Heating Coils - Cooling Coils - and a Complete Line of Aircraft Heat Transfer Equipment.

BUY BONDS
PRODUCE MORE
SALVAGE SCRAP
WIN THE WAR

, Great
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SIX LEADING PURCHASING AGENTS

Pick **KOVEN**
FOR
DIESEL ENGINE
PARTS



Purchasing Agents of leading diesel engine plants...men who are faced with great responsibility, have found from experience that KOVEN can manufacture a part or parts of these engines, faster and more economically than the manufacturer can build them within his own plant.

For over 50 years, KOVEN has specialized in the manufacture of individualized equipment parts. If you are having difficulty building a part or parts of your diesel engines KOVEN will be glad to work with you in manufacturing the exact parts you need. A consultation with a member of KOVEN's trained staff will not obligate you in any way. Call or write KOVEN today.



L. O. KOVEN & BRO., INC.
154 OGDEN AVENUE • JERSEY CITY 7, N. J.

Expands Departmental Activities

THE Sales Engineering and Development Division activities of Aluminum Company of America are being expanded with the appointment of three men to head up special activities. Frank Jardine, who has been in charge of development work in Cleveland, has been given the title of Manager of Development Division, Cleveland Branch. John R. Willard has been placed in charge of the Sales Development Division located at New Kensington, Pa., and B. J. Fletcher has been appointed Chief Engineer

of the New Kensington Branch. All three will report to R. V. Davies, Assistant General Sales Manager.

Engineering Sales Development activities of these two groups located at Cleveland, Ohio and New Kensington, Pa., are nation-wide in character. Mr. Jardine and his corps of engineers will give special emphasis to the automotive and general internal combustion engine field. Mr. Willard and Mr. Fletcher with their associate engineers will assist users of aluminum

in many fields such as petroleum, refrigeration, textile, packaging, printing, marine engineering, as well as in special structural application and general engineering problems.

All three men are Alcoa veterans. Mr. Willard has been with Alcoa for the past 18 years and has spent 15 of these years in sales development work. He is a Purdue graduate in mechanical engineering. Mr. Fletcher has likewise been with Alcoa for 18 years and 14 of these years has been spent in development type of work. He is a graduate of Massachusetts Institute of Technology in civil engineering. Mr. Jardine is a member of Alcoa's 25-Year Club and joined the company in 1918. During all of that period he has been active in sales engineering and sales development for aluminum products.

Arch A. Warner Elected

ANNOUNCEMENTS of the election of Arch A. Warner as president and general manager of Rockford Drilling Machine Division of Borg-Warner Corporation has been made. Warner, former works manager of Mechanics University Joint Division of the corporation, succeeds L. C. Traner, who at his own request has retired from active management of the company to become chairman of its advisory board. Before going to Rockford in 1941, Warner was sales engineer at Detroit for Mechanics, which he joined in 1938.



Arch A. Warner

Prior to his connection with Borg-Warner Corporation, Mr. Warner was with Universal Products for 10 years and for almost as long a period engaged in engineering and sales development work on carburetors for both Zenith and Stromberg organizations.



DIESEL EXPERTS—men responsible for the efficiency, long-life and economical operation of both transportation and stationary Diesels—never relax their fight against sludge, gum, acid and corrosion.

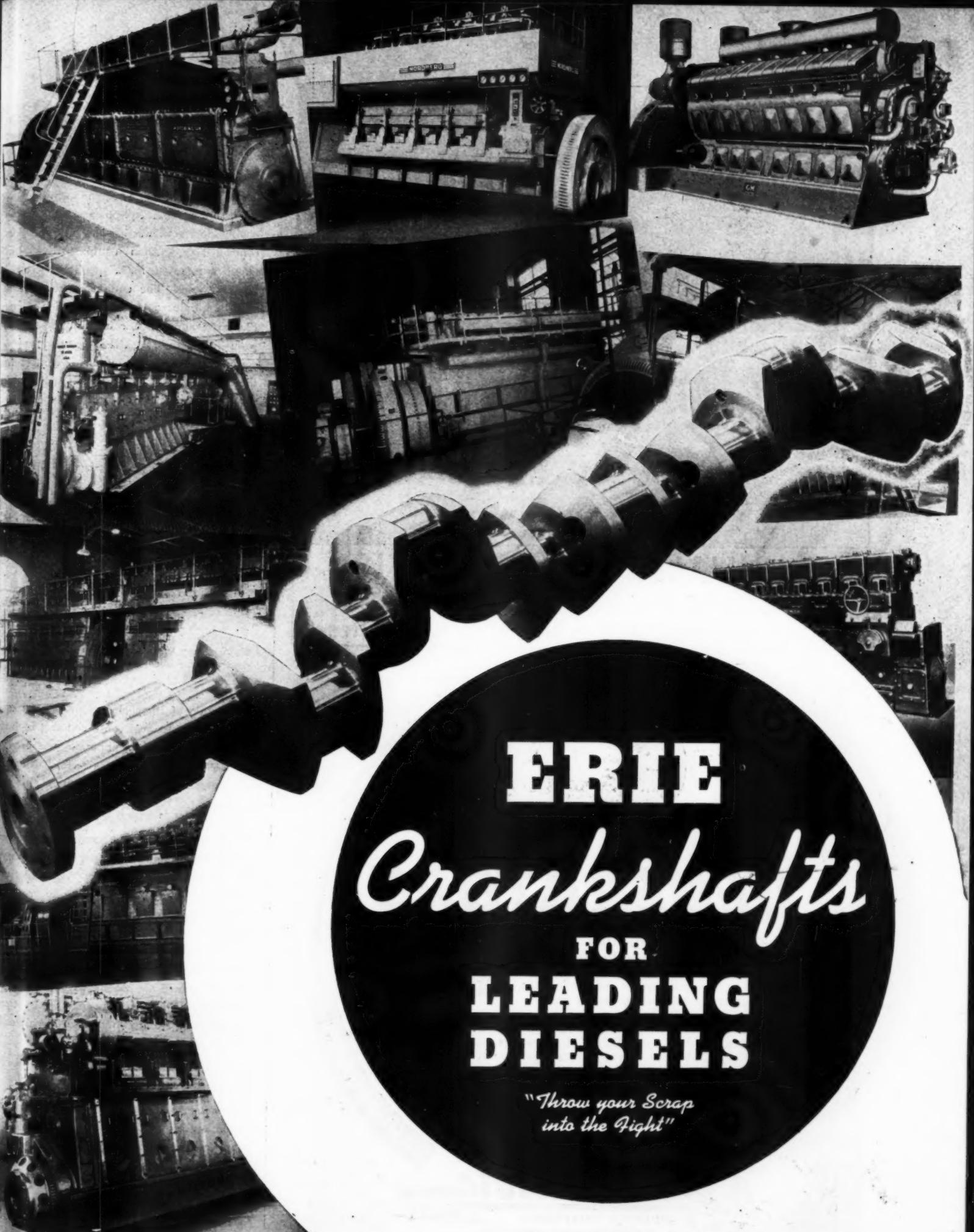
LOOSITE and SILOO MARINE are twin enemies of petroleum residues—the cause of many engine troubles. LOOSITE swiftly, safely and economically cleans out the entire lubrication system. Once clean—SILOO, added to fresh crankcase

oil, functions continuously to prevent further formation of dangerous petroleum residues. Engines operate at maximum efficiency, oil reaches every vital part—thus engine life is prolonged, costly layups and repairs are avoided.

To eliminate and prevent clogging of injectors—use SILOO "SPECIAL" and SOLVENT. Write for complete information engineered to your needs.

General Offices: 331 Madison Ave., New York 17, N.Y.

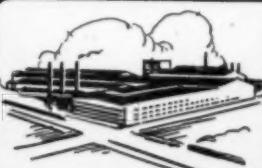
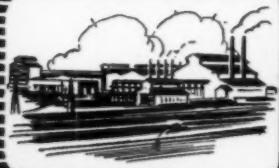
PETROLEUM SOLVENTS CORPORATION



ERIE Crankshafts FOR LEADING DIESELS

"Throw your Scrap
into the Fight"

ERIE FORGE COMPANY, ERIE, PA.



**8 years service
on a Diesel engine**

WALDRON
Gear Type

On a single cylinder diesel to an ammonia compressor, a WALDRON COUPLING has operated almost continuously over a period of eight years with practically no signs of wear. This remarkable performance has been achieved despite the fact that the engine crank

shaft was slightly sprung at the time the coupling was installed — a condition worse than misalignment. Such records for long continuous, trouble free service are not too uncommon with users of WALDRON GEAR COUPLINGS on diesel drives.

Write for our Catalog 56 which describes design refinements, construction details, rating tables, etc. No obligation.

JOHN WALDRON CORPORATION
Main Office & Works — NEW BRUNSWICK, N. J.
SALES REPRESENTATIVES IN PRINCIPAL CITIES

SELF EXCITED **SELF REGULATED**

60 CYCLE AC **BALL BEARING THROUGHOUT**

GENERATORS

Here is a new and interesting generator, designed and manufactured by us—only one of the many different types designed and developed to fit specific needs and applications. The features of this new generator are—Built in either single phase or three phase... Self-excited . . . self-regulated . . . 60 cycle A.C. . . speeds of 1800 and 1200 R.P.M., in ratings from 1 KVA to 18.75 KVA . . . inherent voltage regulation 10—12% . . . ball bearing construction throughout. A standard voltage regulator can be used with this generator, if better voltage regulation than that shown is required. Complete data upon request.

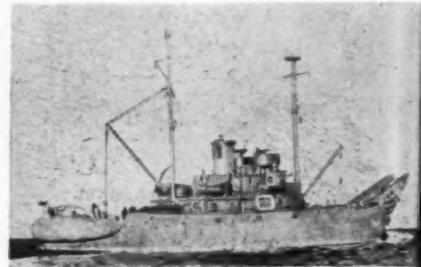
KURZ and ROOT Company
APPLETON - WISCONSIN Since 1898
.....and DC motors and motor generator sets

**Excerpts from 1944
Marine Activity**

By J. W. BELANGER, Manager Federal Marine Divisions, General Electric Company

DIESEL-ELECTRIC

AN increase in the size of individual drives has accompanied the increased output of Diesel electric propulsion equipments. For example engineering work was done on an amplyne controlled propulsion equipment of 15,400 motor horsepower for a quadruple-screw ice breaker vessel. The equipment for this ship will be produced by the Canadian General Electric Company. Use of amplyne control with this largest of d-c Diesel-electric propulsion equipment will permit automatic control from the bridge of shaft horsepower, with speed response, precision, and uniformity not otherwise obtainable.



U. S. Navy net tender YN-57 class, Diesel electric drive with G.E. generators, motors and control.

Production of Diesel-electric propulsion equipment during the year continued at a high rate. 480,000 horsepower of apparatus was produced for 139 tankers, salvage vessels, harbor tug net tenders, fleet tugs, submarines, and mine sweepers.

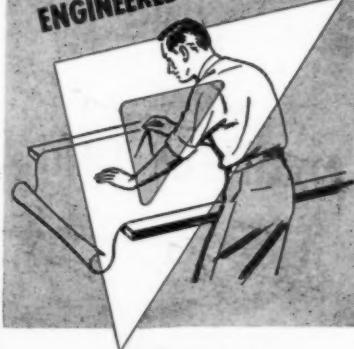
Engineering progress in submarine equipment resulted in as much as 45 per cent more power in the same amount of space, and decreased need for maintenance so that the equipment can be operated longer periods between out hauls.

On surface-ship equipments, there was increased use of surface air coolers to keep pace with ventilation problems associated with increased horsepower. Applications of surface air coolers were made in sizes as low as 500 hp.

GAS TURBINES

War-accelerated engineering advances focused attention upon the gas turbine for various applications, ship propulsion among them. Progress in aerodynamic design and metallurgy—the twin avenues to improved efficiency and higher throttle temperatures—brought the physical size of the gas turbine into the range

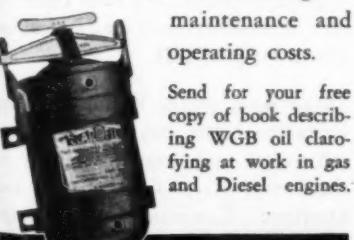
WGB CLARIFIERS ENGINEERED TO THE JOB



TO KEEP OIL CLEANER, LONGER

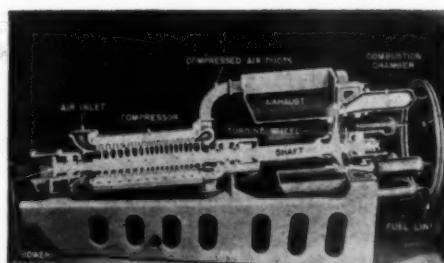
WGB Clarifiers are adopted by manufacturers, specified for fleets. Leading builders of gas and Diesel engines install WGB Clarifiers as standard equipment . . . and countless cost-wise fleet operators have specified them for their vehicles. Check their three reasons. (1) They keep lubricating oil amber-clear for longer periods. (2) WGB replacement cartridges are inexpensive, and can easily be installed, without tools. (3) WGB Clarifiers are sturdy, simple, trouble-free—built for heavy-duty jobs. Specify WGB Oil Clarifiers for substantial savings in maintenance and operating costs.

Send for your free copy of book describing WGB oil clarifying at work in gas and Diesel engines.



WGB
OIL CLARIFIER, INC.
KINGSTON, N.Y.

LET'S KEEP SEDIMENT
OUT OF LUBRICATION



Model in cut-away section of G.E. 3000 hp. marine Gas Turbine.

practicability. The chief advantage of the gas turbine lies in its simplicity, compactness, light weight, and almost complete absence of auxiliaries. Several designs suitable for marine application in approximately 3000 hp. size have been studied.

Basically, the modern constant-pressure combustion gas turbine consists in its simplest form of a compressor, combustion chamber, and a turbine. The term "constant pressure" is used to distinguish this particular equipment from the explosion gas turbine. It does not mean that pressure is constant for operation at all loads, but rather that a steady-flow process is used. Air is compressed to several atmospheres pressure and then taken to a combustion chamber into which fuel is injected. The burning of the fuel raises the temperature of the compressed air, which is passed through the turbine to produce power.

Future applications of the gas turbine in the marine field will be predicated upon the fact that it is a space saver, is simple to operate, and will probably have low maintenance. In at least one instance a design study indicated that it should be possible to approximately double the power of a given ship by replacing the existing prime movers with gas turbines. This indicates that it may some day be practicable to replace the propulsion units of some emergency-built ships with gas-turbine power plants.

New Bulletin on Steel Storage Tanks

A NEW bulletin on Graver steel storage tanks was recently announced. Dealing with expansion-type liquid and gas holders and pressure vessels, also A.P.I. and A.S.M.E. code vessels, the new bulletin is profusely illustrated with reproductions of photographs of a wide variety of tanks and a number of specification and tank engineering charts. A section of the new bulletin is devoted to Graver Weldments, including engine bases, gear housings, etc. Write for a copy of Bulletin C-101 to Graver Tank & Mfg. Co., Inc., East Chicago, Indiana.

USE HEADED AND THREADED FASTENERS
FOR ECONOMY AND RELIABILITY

Alloy Steel BOLTS · NUTS STUDS

Every standard alloy steel fabricated into bolts, nuts, studs and many special fastenings. Accurately made in standard dimensions or to meet your specifications.



BETTER BOLTS SINCE 1882

A full line in carbon steel, heat-treated alloy steels, stainless steel, silicon bronze, brass, bronze, and monel metal.

PAWTUCKET

MANUFACTURING COMPANY
327 Pine Street • Pawtucket, R. I.

THE PLACE TO SOLVE YOUR BOLT PROBLEMS

SPECIFY **HILCO**

★ FOR LUBRICATING, FUEL AND INDUSTRIAL OIL PURIFYING
★ A complete line of lube oil purifiers using Fullers Earth - cotton waste and specially prepared filtering agents.

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TO the question, "Why is an Army-Navy 'E' awarded to a War Plant?" most of us would reply, "For Production." But, that's only part of it! Production is important, of course, but it must be Quality Production, to which regular Attendance of war workers is an essential. Experimentation must point to new and better products, and all of these operations must be carried on in a Safe Plant, well protected against fire, sabotage and other hazards. Foremen and Workers must be constantly Trained in better methods and understanding.



Exemplifying these major factors are these seven Workettes of Koppers Company, American Hammered Piston Ring Division, Baltimore, proudly displaying the only Army-Navy "E" burgee, with three stars, awarded to a piston ring manufacturer.

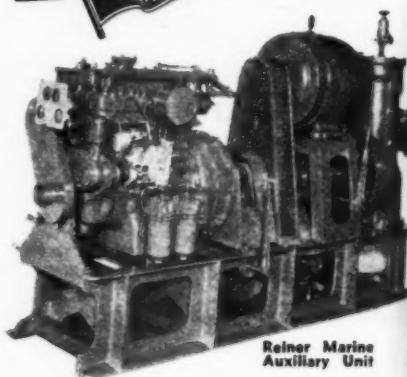
Sperry Products Makes Staff Addition



J. L. Stuart

J. B. FARWELL, President of Sperry Products, Inc., announces the recent addition of J. L. Stuart to Sperry's Technical Staff. Mr. Stu-

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art, late of Anaconda Copper's Consulting Engineer's office, will handle, as Technical Editor, all technical writing relative to the Sperry line of hydraulic remote controls and other Sperry Products.

Eight Diesel-Electrics Carry Super Load at Disembarkation Point

EIGHT Alco-G.E. 1000-hp. Diesel-electrics, replacing 17 steam locomotives, have absorbed a 15 per cent increase in freight ton-mileage, and an unprecedented volume of military passenger traffic, since they were placed in service less than a year ago at the Staten Island, N. Y. yards of the Baltimore and Ohio Railroad.

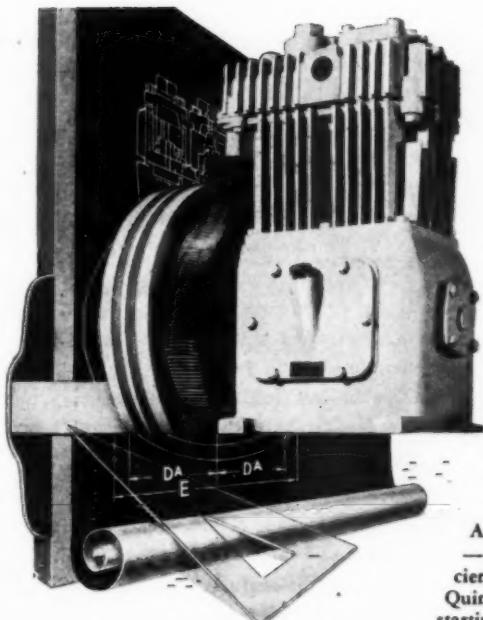


In addition to handling freight traffic which has grown from 1,811,155 gross ton-miles in July, 1942, to 4,418,867 gross ton-miles in July, 1944, these locomotives are hauling as many as 121 passenger trains, of 13 to 21 cars each, in a single month. Moreover, their precision, timing, and immediate and continued availability, make possible the split-second movement of supplies and personnel, which is imperative at this vital disembarkation point.

Operating data for both May and September show that the Diesels were available almost 99 per cent of the time, in the shop for the required 8-hr. I. C. C. maintenance and inspection only 1.3 per cent, and in actual use 98.2 per cent in March and 85.0 per cent in September.

Maritime Commission Awards Contracts For Tankers and CI-M-AVI Vessels

APPROVAL of contract awards for 4 large tankers and the reassembly and completion of from 16 to 30 coastal cargo vessels of the CI-M-AVI type were announced recently by the United States Maritime Commission. Marinship Corporation, Sausalito, Calif., received the award to build the tankers. The tankers are



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Tomorrow*

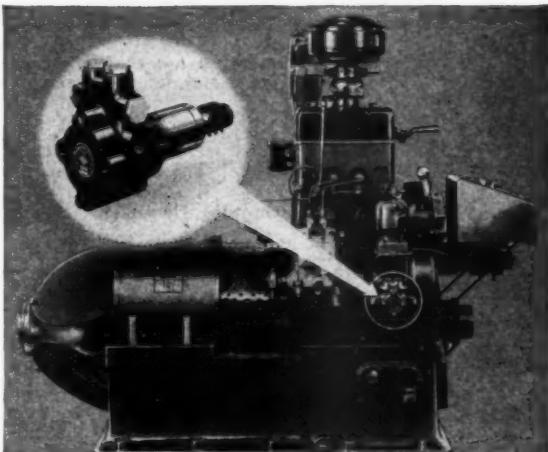
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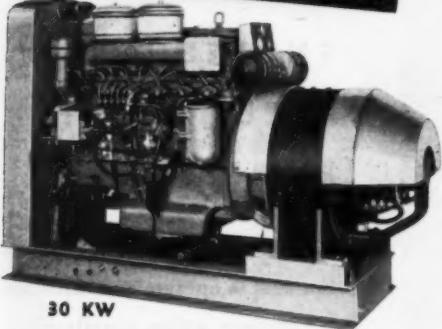
Introduce recommended solution into unit, permit to "soak" or circulate, as directed. Then rinse and neutralize. Inspection will reveal that insulating lime-scale and rust deposits have been completely removed without harming surfaces. Helpful, 28-page booklet gives details. Write for your FREE copy TODAY!

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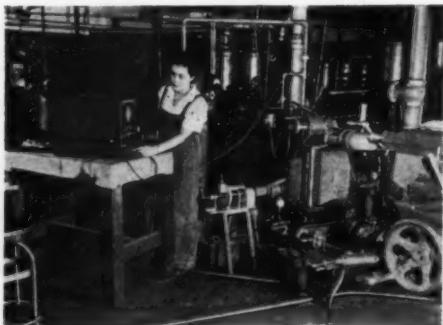
U. S. MOTORS CORP.
542 Nebraska Street
OSHKOSH, WISCONSIN

U. S. DIESEL
ELECTRIC PLANTS

to be delivered to the Navy in September and October 1945. Reassembly and completion of the CI-M-AVI's will be done by the Pendleton Shipyards Company, Inc., New Orleans, La. The Pendleton firm has agreed to take the work of reassembling and completing a minimum of 16 and a maximum of 30, at the option of the commission. The agreement calls for the work on each vessel to be completed in 21 days. The vessels, built at Great Lakes yards, cannot make the trip to New Orleans in completed form because of shallow water and low bridges.

**Russian Girl Engineer
Lauds America**

AMERICA is the world's greatest industrial nation because manufacturers are willing to foot the bills for engineering research whether or not they foresee immediate practical value, Lidia Manson, Russian-born engineer, told the National Association of Manufacturers 49th annual meeting in New York on December 8.



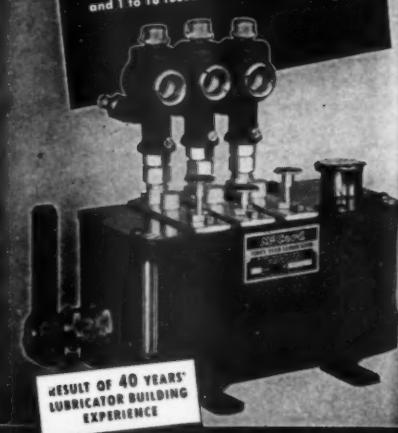
Lidia Manson observing a test in Clark Bros. laboratory.

The young and pretty member of a development engineering team at Clark Bros. Co., Inc., one of the Dresser Industries, was the only woman speaker at the meeting. Her work involves Diesel engine designing. "In almost every other country, the manufacturer is satisfied to shop around for patents as a means of buying success," she said. "Here, however, even the smaller shops have experimental departments and are willing to give a chance to anything that looks as if it might work."



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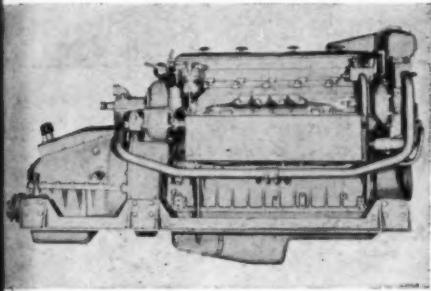
JANUARY 1945

DIESEL PROCESS

Gray Marine Motor Supplying Commercial Engines

THE Gray Marine Motor Company has resumed shipments of engines, both gasoline and Diesel, to commercial fishermen. The company continues at high production on models used by the U. S. Army and Navy, and is currently making prompt shipments on workboat models under priority regulations.

From Gray's complete line of 23 gasoline engines, five representative sizes are currently offered, including the Light Four (69 cu. in. piston displacement), Four-22 (112 cu. in.), Six-71 (a 226 cu. in. model which replaces the former Six-71), Six-91 (244 cu. in.) and Six-121 (330 cu. in.).



Standard model of the 6-cylinder Graymarine Diesel follows many details worked out on "Navy Style" engines as installed in LCVP and LCM landing boats.

Of particular interest to commercial fishermen is the information that all standard sizes of Graymarine Diesels are available: 1, 2, 3, 4 and 6 cylinder models, 25 to 165 hp. These are the Series 71 General Motors 2-cycle Diesel engines, adapted and equipped for marine propulsion by Gray.



32 ft. welded steel fishing vessel designed by Walter W. Haertel and built by Keweenaw Shipbuilding & Engineering Corp. for Smith Bros. of Port Washington, Wis. The new boat which is of advanced design, will be used as a model for future construction. The main engine is a standard 6 cylinder Graymarine Diesel with a reduction gear, turning a 36 x 34 propeller. Boat speed, 12 knots.

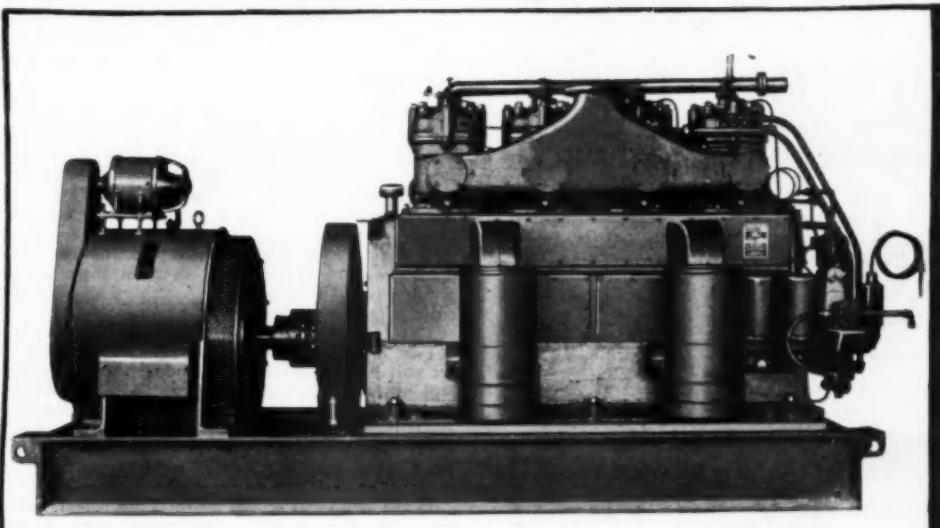
Popular models for commercial fishermen include the 2, 3, 4 and 6 cylinder Graymarine Diesels, and the heavy duty Six-121 gasoline engine which is available with reduction gear ratios of 2:1, 3:1 and 5:1.

THE POWER TO PERFORM

Diesel performance and economy depend upon getting maximum power from every drop of fuel; that means valves that seat with utmost precision. With HALL Valve Servicing Equipment, maximum power and top performance are procured more quickly, — assured longer, — than by any other method. Ask your HALL Jobber or write the factory today for complete information on HALL Equipment and its availability.

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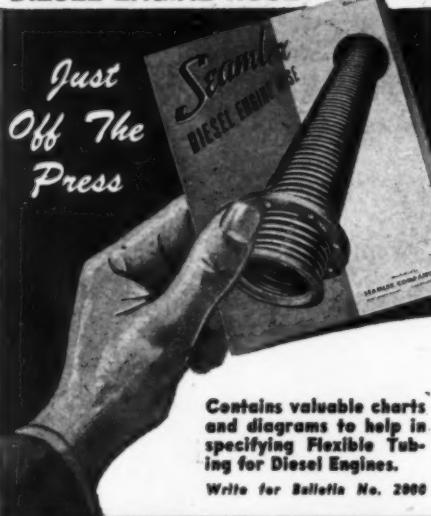
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**DUPLEX DIESEL ELECTRIC GENERATING PLANT,
600 RPM, 60 K.W.**

Duplex Truck Co.
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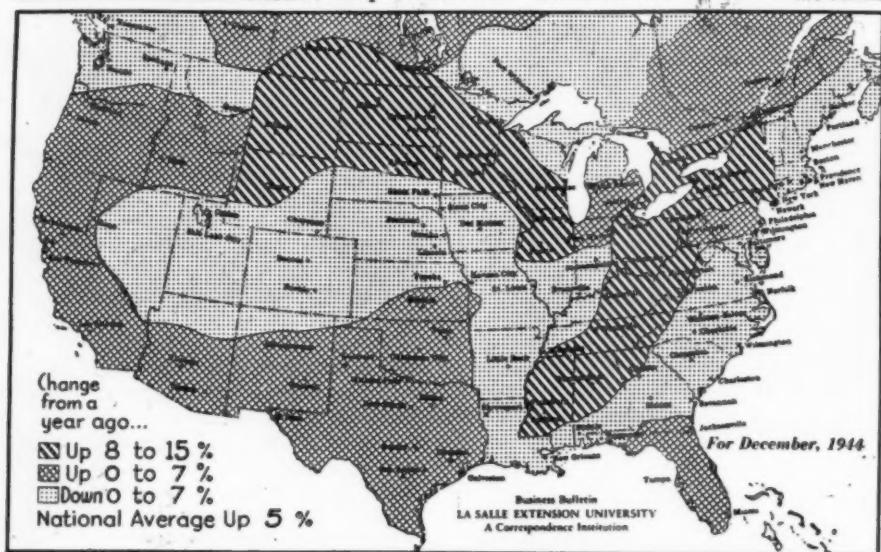
DIESEL ENGINE HOSE MANUAL



SEAMEX COMPANY, Inc.

27-27 Jackson Ave. • Long Island City 1, N. Y.

LaSalle Map of Business Conditions



Business Activity Holds Steady at Near-Peak Levels

Map Supplied by BUSINESS BULLETIN DIVISION of La Salle

The rate of business activity has risen a little in recent weeks and is again very close to the peak which was reached last December. If current trends continue it will reach a new peak, this month, even though industrial production is slowly declining. For several months business has been following about the same trends as it did a year ago, with total volume moving upward while manufacturing has tended to move in the opposite direction. Retail trade as well as financial transaction account for these changes.

While the general average has changed slowly, variations among different cities and regions have become more striking than usual. The average is about 5 per cent higher than last year, but in some places trade is 15 per cent above a year ago. In several cities, it is from 5 to 10 per cent lower. Several of these communities are the ones in which trade was unusually high a year ago and some recession was to be expected. Even in these places activity is far higher than normal and in most cities is far above all previous peaks.

Two sections in the Eastern part of the country are still lagging behind the national average. These regions are the New England states and most of the South Atlantic states. Shifts in war production, shipbuilding, and unfavorable weather for some crops have been factors in holding activity somewhat below the high level of a year ago.

In the industrial region south of the Great Lakes and also throughout a considerable part of the South, business has increased more than the national average. War expenditures in these regions have been high and agriculture has been more prosperous than for many years. Military spending is expected to remain at close to present levels until the war in Europe is over and then some reduction is likely.

Business has been slowing down a little in the South, especially in Texas, but it is still about equal

to the national average. Continued large output of petroleum is holding activity up and will keep it from falling as long as demand remains so large.

An area of very good business is the northern half of the agricultural regions of the Middle West. The bumper wheat crop this year has stimulated trade for it has boosted farm income in that region. The record corn crop is expected to have a similar effect throughout other parts of the farming districts, although it may be offset to some extent by the decline in income from livestock.

The largest area in which business is lagging behind the general average is the Mountain states. Business there is being kept up fairly well by mining operations, but these have not been sufficient to push the rate of activity as high as it was a year ago. Throughout the last four years the increase throughout these regions has been somewhat less than in most other parts of the country. Problems of future readjustment may, for that reason, not be so disturbing and more of the advance will be held.

Conditions in the Pacific Coast states have receded somewhat from the high level of recent months and now show about the same change from a year ago as the national average. They have held up somewhat better in the southern part than they have in the northern half, but in both the rate is not far from that of a year ago. Activity will probably be maintained as long as war demands are large.

In Canada, the high rate of business activity is being maintained and the national average is about the same as it was a year ago. The region of greatest increase is the industrial districts north of the Great Lakes where a large percentage of the war industries are located. Conditions in the agricultural regions have been improving because of the good crops this year. Trends in trade, industry, and agriculture are slightly upward.

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West Coast Diesel News

By JIM MEDFORD

ATLAS Imperials, main Diesel a direct-reversing, 320 hp., and two auxiliaries of 80 hp. supply the power for the San Diego, California, 90-ft. *Sea Wolf*. Wheel is a Lambie, generators are by Westinghouse, built by San Diego Marine Construction for Coast Fisheries.

CHARLOTTE, one of the new "baby clippers," 65' and built by Hodgson-Greene-Haldeman for Mead and Dumm has a 150 hp. Murphy Diesel and a pair of 25 Caterpillar generating sets, F-M pumps and Joes gears.

AT the Newport Harbor, California, yard of North American Shipbuilding Co., a 61' and a 51' purse seiner nearing completion are powered with Caterpillar Diesels—135 hp. and 115 hp. respectively; owners, Nick Despal and Ed Fisher.

FOR Capt. Matt Monise, San Diego, the Clyde Wood yard at Stockton, California, will build a tuna clipper of 140 ft., powered with a Washington super-charged 600/850 hp. Diesel. Equipment includes two Union auxiliary Diesels, F-M generators, a 60 hp. Caterpillar generator plant.

THE Clyde Wood Stockton yard will also build a 112 ft. clipper for Westgate Sea Products, San Diego. Diesels are all Fairbanks-Morse; main, a 540 hp. direct-reversing, and three auxiliaries of 90 hp. with F-M generators.

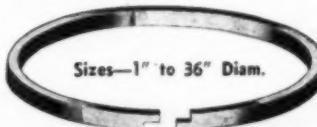
VAN Camp Sea Food Co., has added another craft to its short-range fleet, a 51 ft. tuna boat powered with a 60 hp. Caterpillar marine Diesel and operated by Bob Johnson.

TO speed up deliveries of Murphy Diesel marine engines, Oswald Machine Works, San Francisco, has been appointed distributor for the Bay area.

ANOTHER Cambell repower job is that of the well known survey and laboratory schooner *E. W. Scripps* of the Scripps Institute at La Jolla, California. The new engine is a 200 hp. Union Diesel.

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Here's an internal-gear rotary pump with a built-in automatic by-pass that allows small chips and grit to pass through without serious injury to working parts. Precision-built, this Tuthill Model M pump provides long, uninterrupted service. Sizes from 1 to 50 g.p.m. Available in stripped form for direct incorporation into the design of the machine. Write for complete catalog.



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for Most Efficient Diesel Lubrication

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New York

AT the Lynch Shipbuilding yard, San Diego, California, the 110-ft. *Portuguese*, tuna clipper for an unnamed owner is to be powered with a super-charged Enterprise marine Diesel of 800 hp.

AT Vancouver, B. C. Park Shipyards has installed a 200 hp. Atlas Imperial Diesel in the 72 ft. seine boat of Norman Fiddler.

OVER at the Harbour Boat Works, also of Vancouver, the new 78-ft. seiner for Kyuquot Trollers Association is to get a 200 hp. Atlas Imperial Diesel.

ANOTHER 200 hp. Atlas Imperial Diesel has been ordered for installation in the Nootka Packing Co's 80-ft. seiner-tender now under construction at Benson yard, also of Vancouver.

THE B. C. Packers are installing their second Fairbanks-Morse Repower job in a fleet craft. This is also a 320 hp. at 400 rpm. Diesel for main propulsion in their freighter *Teco*.

A STORY of Diesel Engine performance should be in order—the 60-ft. tug *Ancon* of Oakland, California, her Caterpillar marine Diesel turning a 52-in. propeller towing heavy pipe pontoons does 15 hours work on 60 gals. of 8 cent fuel.

GEORGE Innes' new hook-and-liner built by the Sausalito, California, yard of Madden and Lewis will have a new Gray marine Diesel in her 45-ft. hull.

AT Kirkland, Washington, the new 70-ft. dragger *Marvel* has been powered with a Cummins marine Diesel of 175 hp. Capt. Carl Handley of Bellingham is the owner.

ANOTHER Cummins (125 hp.) Diesel has been purchased by Miles and Smith of Eureka, California, for installation in their new 55-ft. fisherman. Reduction gears are Twin-Disc.

THE Kettenberg Boat Works, San Diego, California, continues to fill orders for its standardized 38-foot utility fish boats. All powered with 60 hp. Caterpillar marine Diesels, the new owners are R. M. Austin, J. R. Bunker, Leslie Brady and Jack Childress.



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Associate Engineer, Burns & McDonnell Engineering Co.
667 pages, 182 illustrations,
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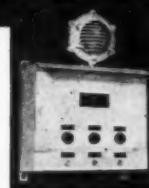
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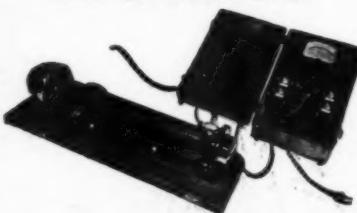


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Enterprise Reports Engine Sales

THROUGH Enterprise's Eastern Canadian distributor, Russel-Hipwell Engines Limited, the Royalite Oil Company has placed an order for an Enterprise 400 hp. at 400 rpm. Diesel engine for a Sluge pump application. Enterprise Engine and Foundry Company engineered the complete specialty unit which is a V belt drive—mounting the engine and Sluge pump on skids for portable application.

THE Irving Oil Company, through Russel-Hipwell Engines Limited, have placed their order for an Enterprise Diesel engine, rated 720 hp. at 300 rpm. to repower a 150 foot trawler.

PETERSON Boat Building Company, Tacoma, Washington is constructing a new purse seiner to be powered by an Enterprise Diesel engine, turbocharged, rated 400 hp. at 400 rpm. Many other yards are placing orders for Enterprise turbocharged engines which are in demand by fishing craft owners for higher horsepower.

CONSOLIDATED Fisheries Co., Lewes, Delaware, are repowering a Menhaden boat with an Enterprise Diesel engine, rated 400 hp. at 400 rpm. The boat is being reconstructed at the Brown Marine Ways.

PANISH CONTROL MEANS FOOLPROOF CONTROL



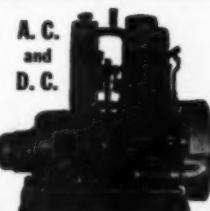
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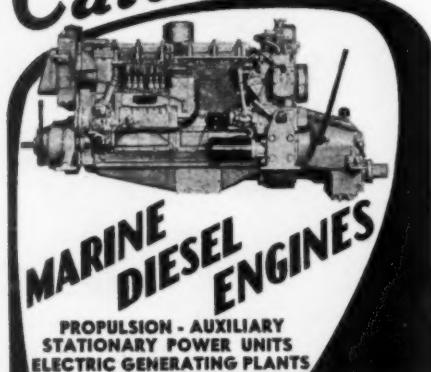
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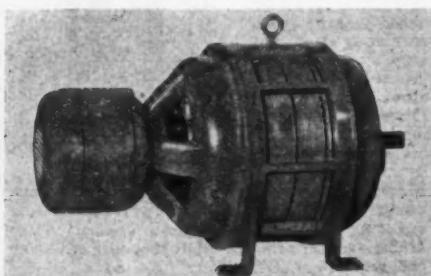
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